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The Outlook

Aids or Arbiters

THOSE older members of the audience at Mr. Pritchard's lecture last week must have been struck by the comparatively small real progress which has been made in blind-approach and blind-landing technique during the past ten years. For it is more than ten years since the first serious use was made, at one or two Continental airfields, of the Lorenz blind-approach system, which was later taken up over here by Standard Telephones. This system provided a very fair means of directional guidance, and the only real improvement shown by, say, the SCS.51, has been the addition of a glide-path indication which is of more than mere academic interest. In the Lorenz system the glide-path indication was decidedly vague, but transport pilots learnt, even in 1936, to come in with fair accuracy while using a sensitive altimeter and the signal emitted by the two marker beacons. To-day the situation, when using even the most modern equipment, seems to be very little better than it was in that far-off year, and the entire business of handling a large aircraft has become even more complicated.

Of the other two methods outlined in the lecture, one, B.A.B.S., involves the need for heavy and bulky equipment in the aircraft, and only the Ground Controlled Approach system seems to go some of the way towards reducing the airline captain's troubles during the most difficult part of any flight. The disadvantages of this system were explained by Mr. Pritchard, but he agreed that it offered, so far, the best compromise and the best value in all-round approach and air-traffic control aids.

The situation may improve when it becomes possible satisfactorily to link up approach indications with automatic control. As usual, in such cases, we in this country have been making experiments with unsuitable equipment, but even so the results have been promising. When the latest types of automatic pilot come into use it should be possible to go a great deal further, and already, one understands, developments on these lines have been largely completed in America.

But until approach aids generally are more reliable and more easy to use, it would be as well if, as our contributor "Indicator" remarked in his comments last week, these are still used with discretion and in cases of unexpectedly worsening weather conditions only. Blind approach, in fact, should continue to be used as an emergency aid rather than as a means by which a hundred per cent airline regularity can be attempted.

Safety Comparisons

NO doubt it is a somewhat tiring truism to say, once again, that statistics can be made to prove anything. But nowhere is this more certain than when they are used to prove the safety or otherwise of air travel. Elsewhere in this issue some figures recently published by the Ministry of Civil Aviation are summarized and dissected.

It has always seemed to us that, when dealing with aircraft accident figures over a period of years, quite different bases of comparison should be used when judging aircraft safety as such; when considering the relative standards of passenger travel safety; and when comparing figures for different years of operation. It might be fairer, for instance, when comparing the actual safety factors, *per se*, with those of other forms of transport, to give the number of accidents per hour rather than per mile of operation. From the individual passenger's point of view, however, the relative safety might still be judged best against a mileage figure—though mileage is the least valuable criterion. Finally, if a really useful comparison between different years of air transport operation is required, then the figure should surely be based on the number of separate flights made—since ninety per cent of the dangers of flying must appear

during or just after each take-off and at or just before each landing.

In the published statistics, the two most instructive figures are undoubtedly those giving, over different periods, the number of flights made for every fatal accident suffered, and the grand total of passengers and crews who have actually lost their lives. The former shows a slowly but steadily rising danger-figure between 1931 and 1945, with, however, the greatest danger between 1925 and 1930. The total casualty figure for the years between 1925 and 1946 is, nevertheless, quite remarkably low when it is compared with that registered in other transport spheres.

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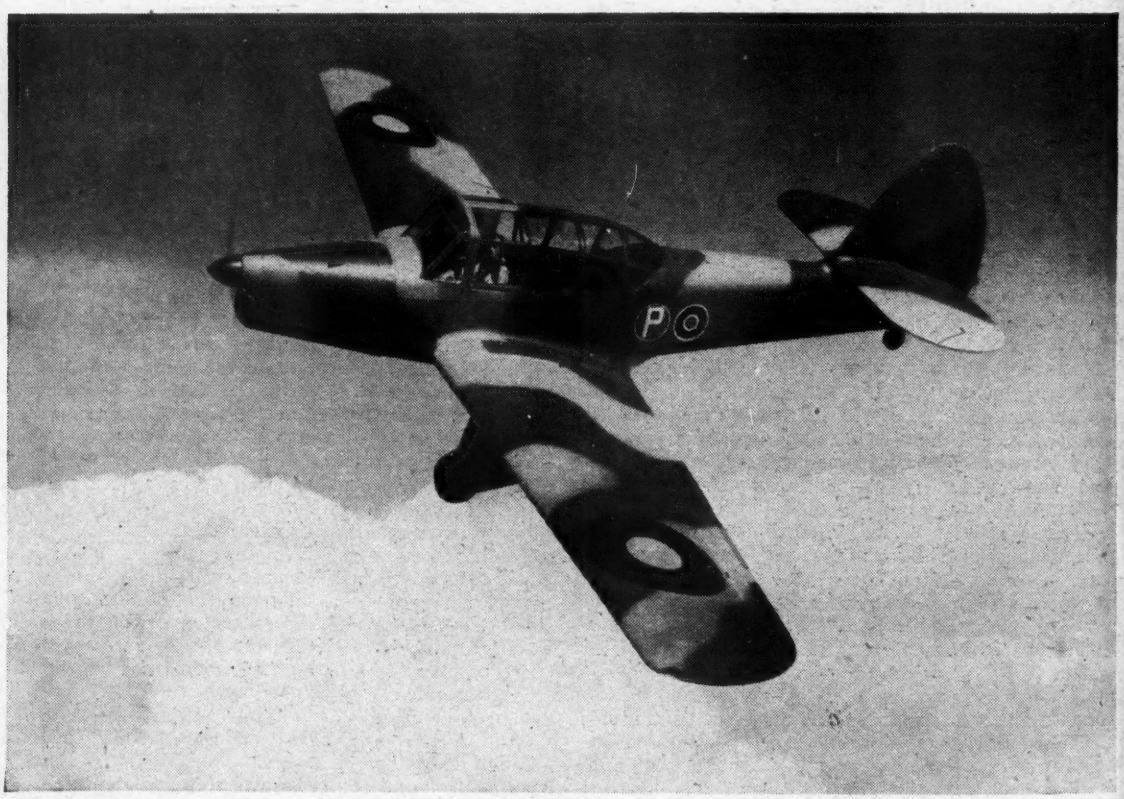
Cheap Power

THAT the demand for a simple low-priced but *reliable* engine for light aircraft is growing is becoming increasingly obvious. Reference has been made to the fact on more than one occasion in this journal, and it may be that the official announcement, brief though it is, by the Engines Branch of the Nuffield Organization that a four-cylinder horizontally opposed has been designed by them and that prototypes are about to be constructed, foreshadows the coming of such an engine.

Our readers may be reminded that several years ago the Nuffield Organization produced a radial aircraft engine, and that it was common talk in those days that the ideal aimed at was one pound weight and £1 sterling per horsepower. That did not prove possible with the radial, but the new flat four may achieve, not the £1 per h.p., that would probably be impossible in present circumstances, but the modern equivalent might be in the region of twice that figure. Even so, it would represent a very welcome reduction on prices now obtaining.

In America the horizontally opposed light engine has become very popular, and engines such as the Continental, Franklin and Lycoming have sold in vast numbers and at fairly low cost. The four-stroke which has had the field to itself in America appears likely to have its popularity challenged by certain two-stroke types now being developed, notably by the X-type being developed by General Motors, with four double cylinders. Research has indicated that with direct fuel injection the two-stroke can be made to idle quite well and can give quite a reasonable fuel consumption at cruising revs. For the four-stroke also there are advantages in direct fuel injection, and it is to be expected that the Nuffield engineers will not have overlooked these.



PROCTOR'S PROGENY: A delightful new view of the prototype of the Percival Prentice elementary trainer, with de Havilland Gipsy Queen engine. The Prentice is an all-metal three-seater designed to meet the requirements of Specification T.23/44 and is fully aerobatic.

Towards Complete Automaticity

Sperry A.12 Electrically-operated Automatic Pilot Described : The Gyrosyn Compass

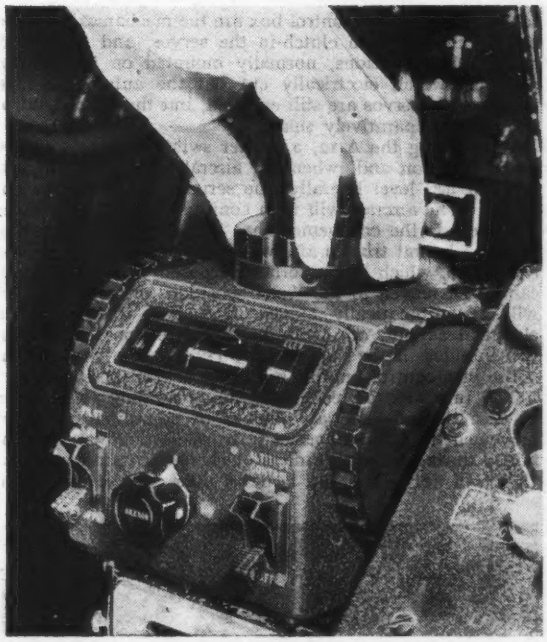
IN their development and application the various automatic pilots, though satisfactory for continuous use in normal conditions, have so far suffered a certain number of faults and operational disadvantages. For instance, they have not normally been capable of dealing with control corrections over the entire speed range; they have required fairly constant readjustment while in command; they have been somewhat complicated in operation from the pilot's point of view; and care has had to be taken to ensure that the aircraft would not be uncontrollable after engagement or disengagement.

Many difficulties and disadvantages are being cleared up, and, though one can never say that all problems have been solved, some of the latest equipment seems to be providing both the accuracy and adaptability to suit modern needs. Completely perfect functioning and operational simplicity with such devices can, however, only be obtained at some cost in complication, overall weight and expense. As with most of the other devices which have come into regular use in aircraft, simplification has only been made possible by complication.

Reaction Graphs

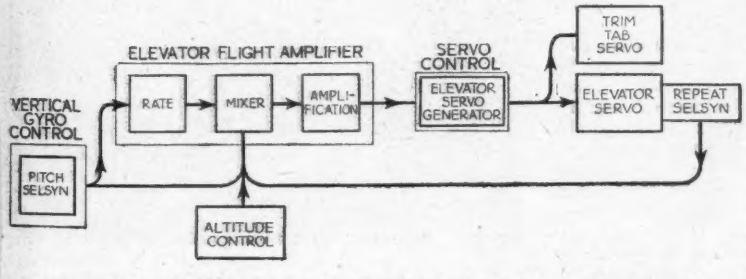
At present only an inner ring of manufacturers, airline operators and their senior pilots have been given the opportunity of discovering how the new Sperry A.12 automatic pilot, for instance, does its work in practice. The equipment is now installed in an R.A.F. Liberator, and tests have been proceeding for some time, but we have so far had no practical experience on which to draw when describing its operation. But, judging both from the incidental comments of those who have had such practical experience, and from a study of the reaction graphs made by the R.A.E., the A.12 appears to do all that its manufacturers claim. The graphs, in particular, cover corrections at all speeds down to those normally used for an approach, and show a very considerable improvement on the lines "drawn" when the Liberator is in the hands of a competent human pilot.

It will be remembered that the Sperry A.3—which, though not often known by this designation, has been very nearly the standard automatic pilot in transport aircraft—operates pneumatically, while the actual control movements are made hydraulically. Following experience with the A.5, designed for military purposes and, in particular, to provide accurate bombing run-ups, the A.12 is entirely electric.



The pedestal for the A.12. The anonymous hand is on the "turn" knob, with the dual elevator trim wheels on each side. Above, on the face, are the indicators showing the trim condition, with the master switch below on the left, the altitude switch on the right and the aileron trim knob in the centre

Briefly, two gyros—one for compass control and one for pitch-roll control—feed signals to an amplifier, which, in turn, provides the necessary power for the operation of servo motors in the three control runs. More important still, the signals are "mixed" in the amplifier unit to give varying outputs to suit both the amount of actual displacement and the rate of this displacement. Since the corrections are made electrically, these are immediate apart from any natural lag in control reaction. An initially strong signal overcomes the electrical "inertia" in the servo system and this is afterwards reduced by an opposing signal measuring the control movement. The directional corrections are made by a Gyrosyn compass unit, in which a directional gyro is continuously "slaved" to a magnetic course by means of a compass needle operating in a unit known as a "flux valve." Finally, so that the automatic pilot will not need to cope continuously with out-of-trim conditions, and the aircraft will be in correct fore-and-aft trim whenever the automatic pilot is disengaged, the A.12 system also incorporates an automatic elevator-trim Servo. This operates independently and actually moves the normal manual trimming tab whenever the automatic pilot senses the fact that it is fighting an out-of-trim condition. So much for the main outline.



A schematic drawing to show the "circuit" in one of the control systems—that for the elevator.

From the pilot's point of view, the operation of the A.12 could hardly be more simple, and a series of interlocks positively prevents engagement if the small needs are not satisfied. On the small control box there are two switches, dual pitch-control knobs,

TOWARDS COMPLETE AUTOMATICITY

one "turn" knob, an aileron trim control, and three indicators. Outside the control box are the mechanical engagement controls which clutch-in the servos, and two emergency release buttons, normally mounted on the control columns, which electrically cut out the automatics. In this case the servos are still engaged, but the friction introduced is comparatively small.

When using the A.12, a master switch is moved to the "on" position and, when the aircraft has been trimmed more or less level laterally, the servo controls can be engaged. The aircraft will then continue to fly in the same attitude. It the engagement has been made slightly wing low, the lateral trim is afterwards adjusted on the aileron trim knob, which has no other purpose. The pilot switch cannot be moved to the "on" position (or, alternatively, will be automatically moved to "off") if there is no electrical supply, or if this has not been on for at least two minutes, if the master servo controls are engaged, or if the turn control knob is not in its neutral position.

The turn control feeds in bank—according to the rate of turn desired—and an amount of co-ordinated rudder movement to make a correct turn. Co-ordination is maintained during turns regardless of changes in air-speed, but they will not necessarily be level unless the altitude con-

The flight amplifier assembly, showing the "tuning" adjustments which are made and set after installation.

trol is used. This is brought into action by moving the second switch already mentioned. Altitude is then maintained within certain limits (plus or minus 20ft), while attitude corrections are still fed to the elevator servo. Means are incorporated in the control to ensure that initial corrections are made gradually, so that any malalignment of the aneroid signal system will cause no sudden change of attitude.

Whenever the master switch is "on," the gyro correction signals are continuously fed to the servos, so that these follow the changing attitude of the aircraft; thus, when the servos are first engaged, there should be a smooth transition from manual to automatic control.

The relationship between the gyro signals and the aircraft's attitude is shown on the three indicators on the control pedestal. Whereas the separate elevator trim-tab servo would keep the fore-and-aft trim correct, and its indicator needle would consequently fluctuate around the neutral position, a continuous indication one way or other of the rudder or aileron meters would show quite clearly that the automatic pilot was fighting an out-of-trim condition, and would thus suggest the need for re-adjustment of the manual trimmers. As an example, if the starboard outer engine faded through fuel starvation, the constant-speed airscrew would be likely to maintain cruising revolutions and the boost figure would, therefore, be unaltered. With the automatic pilot in action the captain might not

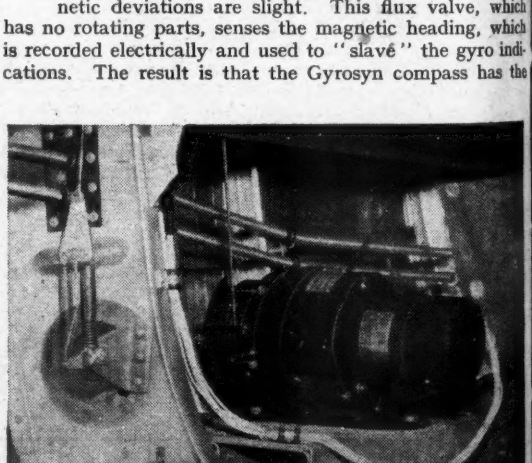
The gyro controls for the three servos. On the left is the Gyrosyn compass control and on the right that for pitch and roll control.

even be aware of the loss of this power. But the fact would be made obvious by the way in which the rudder and aileron meters would be continuously offset in relation to their normal datum. Before disengaging the automatic pilot, these three indicators will therefore show whether or not the aircraft is in trim to suit the particular attitude.

The Gyrosyn Compass

As already explained, directional corrections are provided by a Gyrosyn compass, which might be described as a combination of the distant-reading magnetic compass and a directional gyro. When an aircraft is fitted with the A.12, the compass control is part of the automatic pilot equipment, and the visual readings for maintenance of course are given on a series of repeater dials. The principle of the compass control is, however, entirely similar to that of the basic Gyrosyn compass which can be installed independently with as many as six separate repeaters.

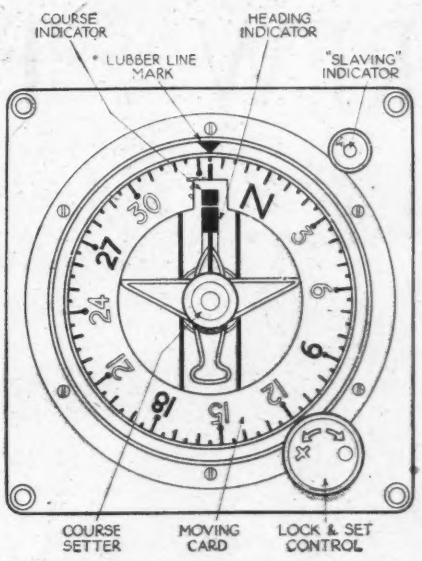
The stabilizing gyro of this compass is basically similar to that of the standard directional gyro, but the dead-beat movements of the indicator are monitored through a selsyn by the flux valve, which is very small and can be mounted wherever the magnetic deviations are slight. This flux valve, which has no rotating parts, senses the magnetic heading, which is recorded electrically and used to "slave" the gyro indications. The result is that the Gyrosyn compass has the



One of the three control servos installed in a Liberator. Its length is about a foot. The cables are taken round the drum seen on the left.

dead-beat characteristics of the directional gyro, but is always showing an actual magnetic course. An indicator tells the pilot that the gyro is correctly showing the magnetic heading and not merely behaving, through electrical failure, as a simple gyro.

In the American version of the Gyrosyn, this and the repeaters have a fixed compass card with a moving pointer and a "tramline" course-setter. The British type will have a moving card and a fixed "aircraft" somewhat similar to that used in an artificial horizon. Every effort has been made in the instrument to make the actions of course-holding and course-changing by the pilot absolutely natural. This new dial form is shown in the accompanying drawing. A further development is that of a special navigator's repeater with a six-inch dial showing individual degrees and with a magnetic variation adjustment. When the navigator sets the necessary local variation on the instrument—in the same way as the millibar figures are set on a sensitive altimeter—the indication is adjusted on all the repeaters to give a true course.



The British version of the Gyrosyn compass dial which has been designed so that all corrective actions are natural.

Amplification

But to return to the A.12 automatic pilot itself. Once the electrically driven gyros for the various axes have provided their displacement signals, these must be increased sufficiently to provide the necessary control-operating power. This work is done by a flight amplifier which not only increases the strength of the signal, but adds a rate factor to the displacement signals. Other amplifiers, all in the same assembly, operate the compass, the turn and the altitude controls. Accessible outside the amplifier box are the adjustments provided for calibration to suit the characteristics and the control forces of each particular aircraft. These adjustments would be made during the flight tests after installation. No later resetting is necessary for different conditions of weather.

From the amplifier the power is taken to the servo control unit, which steps up its strength to operate the servos. This unit is simply a D.C. motor driving three generators to supply the power for the servo units operating the ailerons, rudder and elevators.

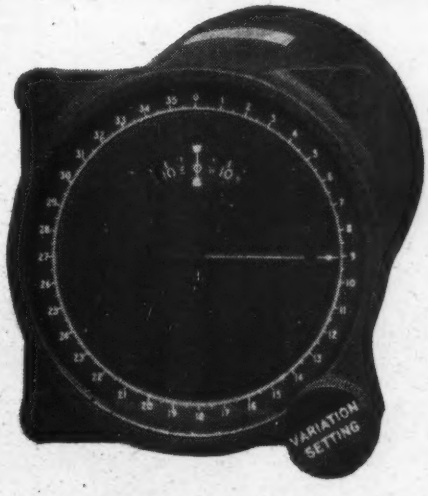
These servos can be incorporated where most convenient in the normal control-cable runs, the cables being wound in each case around a drum which is driven by an electric motor through a positive clutch. The main engagement levers, which may be operated separately or together, control these clutches, and when not engaged the drums turn freely. The whole operation is strongly spring-loaded, so that there is no possibility of partial engagement or disengagement. In the case of the elevator trim-tab servo, this is engaged through a friction clutch only when the main elevator servo control is also engaged, and it is possible to overpower it.

It is obvious that in any aircraft which are intended already to employ control servos, the installation of a pilot of this type can conveniently go hand in hand with control layout development. Incidentally, the weight of the A.12 equipment is in the region of 120 lb.

There are quite a number of later applications for such an automatic pilot, in addition to its normal functions. Work has been completed in America on the development of an automatic approach system whereby the beam signals as indicated on the cross-pointer dial are used to control the course while the glide path is held constant, so that only the air speed will remain to be regulated by the pilot. A further development is that of automatic air-speed control, by which the throttles themselves are moved to hold a constant speed during the approach.

The routine for making an automatic approach—for which either a Sperry Microwave or the SCS.51 system can be used—is comparatively simple. When the aircraft has been cleared for landing by airfield control, the undercarriage and flaps are lowered and speed reduced to that required on the final approach. The automatic pilot is set to give approximately a 2½ deg glide angle, but the altitude control holds the aircraft level until the approach is to be started. The aircraft is flown to a position at which the localizer beam can be intercepted at an angle of 45 deg. and in a position sufficiently far out for the aircraft to be well below the glide path. The cross-pointer needle will thus be showing full upward deflection. Meanwhile the directional needle will be indicating full horizontal deflection. As soon as this has moved towards the centre of the instrument, the automatic approach control is engaged so that its signals are fed to the automatic pilot. During this time a constant altitude has been retained, but as the glide-path needle also reaches its central position, the approach control is set to "connect" the automatic pilot to the glide-path signals, and the altitude control is then automatically switched off. Since the automatic pilot has already been adjusted to give a 2½ deg glide-angle, this is held unless the glide-path signals cause a correction.

The A.12 is, one understands, likely to be built in this country and, alongside other developments of our own, may have considerable influence on future aircraft control design and layout—particularly on large transports. The next move will be that of producing a version suitable for feeder-line types, for which the need for automatic control assistance must be almost as great in bad weather conditions.



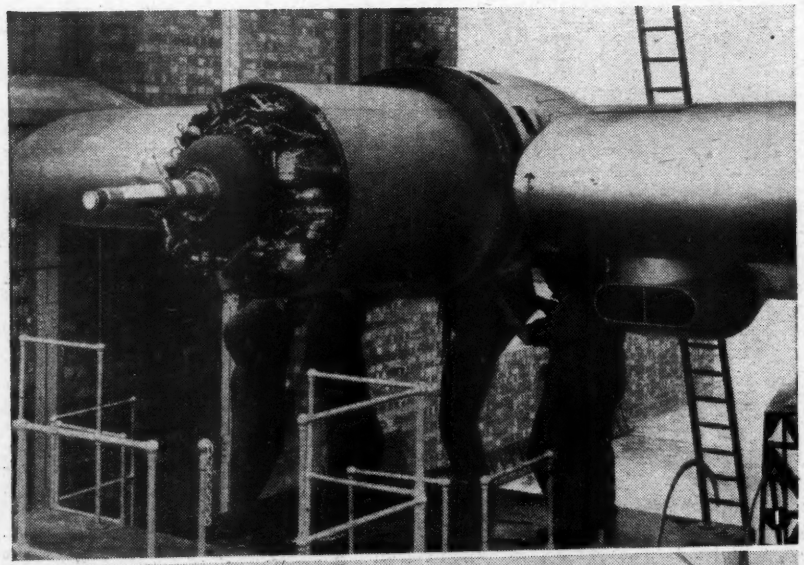
The special navigator's master indicator dial on which the magnetic variation can be set, this variation being then applied to the indications of this instrument and of the repeaters.

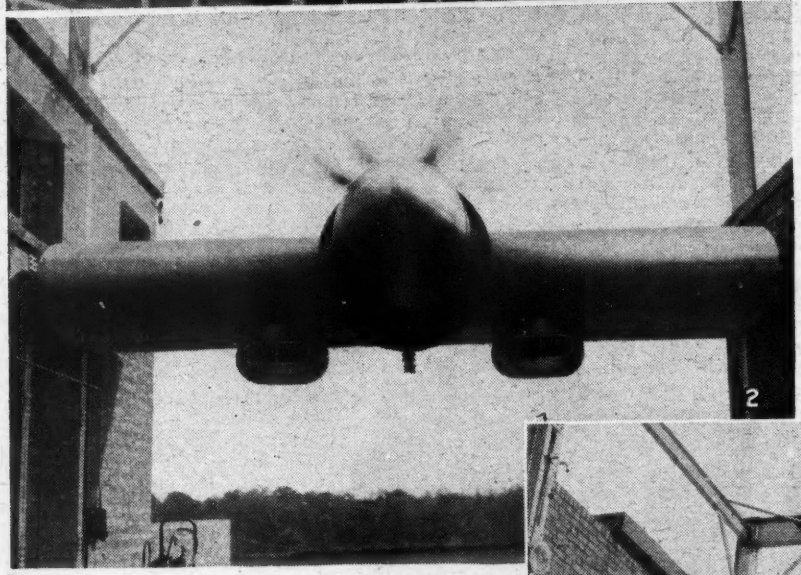
LESSONS FROM BIRDS

SOME 230 people, including a number of senior executives of the Fairey Aviation Co., Ltd., attended the lecture given by Capt. J. Laurence Pritchard, secretary of the R.Ae.S., at the Fairey canteen on Oct. 17th.

The lecture, one in the series arranged by Aerotech Flying Club No. 1, was entitled "Bird Life and the Aeroplane" and in it Capt. Pritchard had marshalled considerable evidence to show that man has much to learn from nature in the matter of flying. The next lecture is on Nov. 7th.

AIRSCREW TURBINE





THE initial development of airscrew-turbines is proving a much longer and more exacting task than that of the less complicated turbo-jet units, and although the airscrew-turbine is generally regarded for most duties as the intermediate stage between piston and pure jet engines, in this instance progress is in effect in reverse, the pure jet having reached the more advanced stage.

Very few flying hours have been completed with airscrew-turbines in this country or America, and only a small number of running hours with airscrews. Considerable experience has, however, been gained on the test beds against the dynamometer.

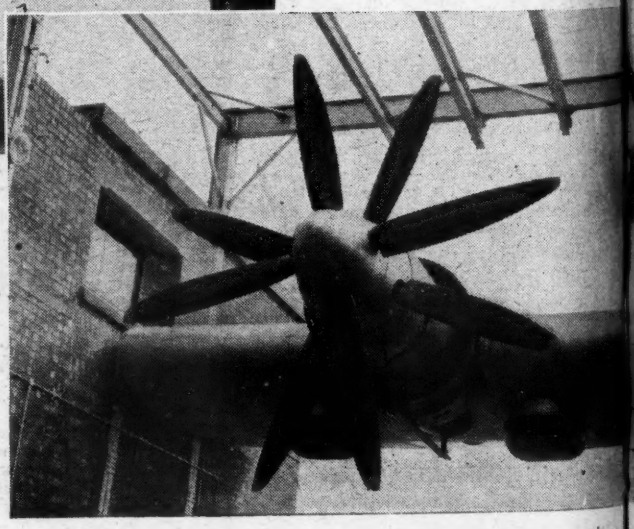
Plans for the flight-testing of at least four different British airscrew-turbines are in an advanced stage, and several aircraft prototypes have been announced which are to be powered by these units. The most favoured aircraft for use as flying test beds are the Avro Lancaster or its development, the Lincoln. On these airframes, power units to be tested may be installed in place of the outboard Merlins, or one could be installed deep in the nose in place of the gun turret and in addition to the four Merlins. This last-named arrangement would provide an installation accessible in flight but would have limitations in view of the forward position and the weight of the larger turbines.

Airscrew-turbines are now earmarked for long, medium and short-range transports, and in the military sphere for naval aviation designs in particular. Two of the most interesting and promising British examples are the Armstrong Siddeley Python and Mamba. These two, respectively the highest-powered and smallest airscrew turbine so far announced, are now well advanced, and are the designated power units for many civil and military aircraft of the near future.

1. Installing a Python in the wing test rig at Ansty, Coventry. The figures lend scale to this large power unit.

2. Fitted with its airscrews and spinners, the running Python has a particularly clean appearance. Its maximum power output is 3,670 s.h.p. plus 1,150 lb thrust.

3. Because the test rig is stationary, special large oil coolers are required These and the air intakes will be in the wing leading edge.

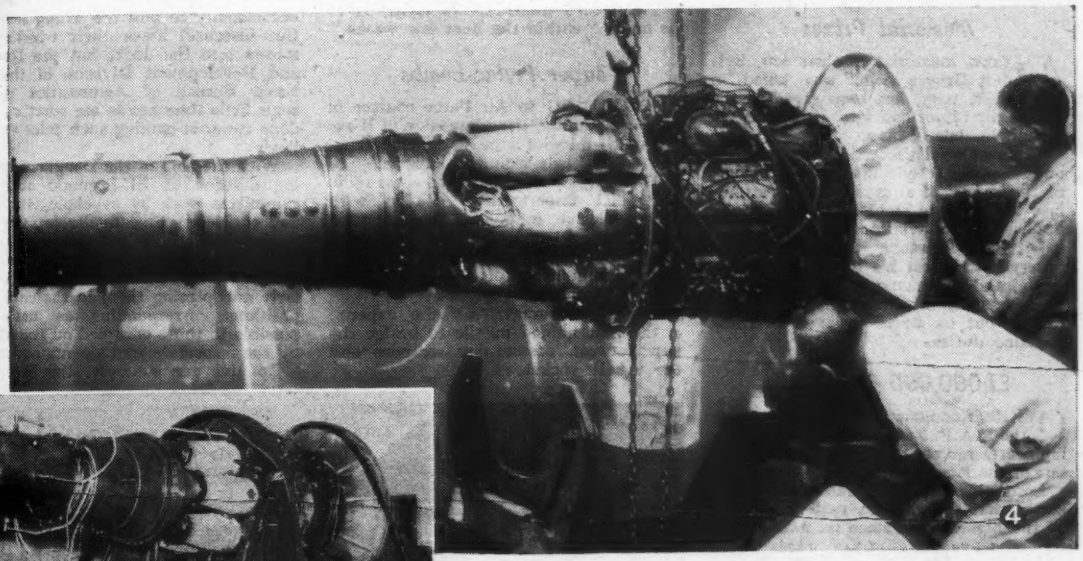


E PROGRESS

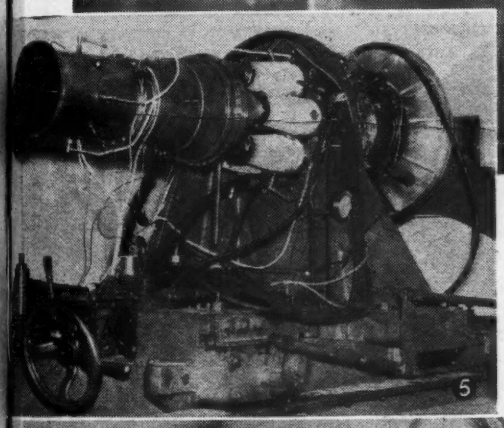
...strong Siddeley Python About to Begin ...ht Tests : Mamba Shaping Well : A New Starter Under Development

The Python has recently successfully completed a 25 hours' run with Rotol airscrews at the company's test establishment at Ansty, Coventry, and photographs of the installation and the unit under test appear on these pages. Preparations and drawings are now complete for the installation of two Pythons in the outboard engine positions of a Lincoln. The associated company, Armstrong Whitworth, await delivery during the next week or so of the two power units.

Development of the newer Mamba is not quite so far advanced, although the progress since design of this smaller unit has been exceptionally rapid, and remarkably few teething troubles have been experienced. In September, six months after running for the first time, it was giving its designed full power.

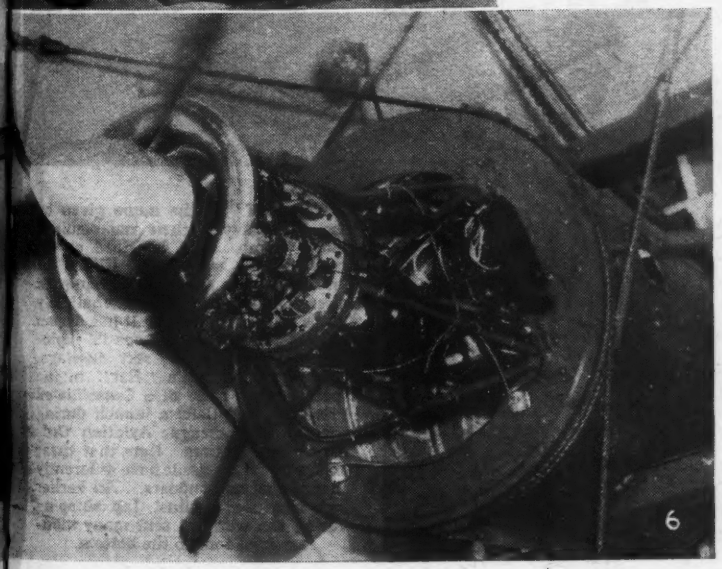


4. Lowering a Mamba into its cradle. The weight is only 750 lb.



5. A Mamba is prepared for test against the brake. It delivers 1,010s.h.p. and 320lb thrust at 14,500 r.p.m.

6. First picture of a Mamba on test with airscrew fitted.



The gas flow is "straightened" by clustering the combustion chambers between the axial-flow compressor and the turbine instead of packing them round the compressor casing, as on the Python. The air, therefore, enters through an annular intake either around the spinner or just behind it, and passes direct through the compressor into the combustion chambers.

A single 10ft hydromatic airscrew absorbs the 1,000 shaft h.p. The total weight with airscrew will be just about 1,000 lb, and the diameter over the cowling only 27in. Particular characteristics of the Mamba are its high installed power-to-weight ratio and low fuel consumption.

First of the Armstrong Siddeley gas turbines, and predecessor of the Python, the obsolete A.S.X. turbo-jet, is still doing useful work at Ansty for the development of a starter for the Python. The company have designed an efficient gas starter to work on compressed air or a slow-burning cartridge. The intention is to use it in conjunction with a small mobile ground compressor, but to carry cartridges on the aircraft for "unscheduled" starting.

The starter turns the A.S.X. up to 1,500 r.p.m. in about 30 seconds, using an air pressure of 100-140 lb/sq in. The unit lights up and accelerates without difficulty from this speed. A separate starting jet is now fitted to each combustion chamber.

HERE AND THERE

Mustangs and Sweden

NINETY fully armed Mustang fighters are being purchased by Sweden from the U.S. at the modest price of £875 each. The sale, approved by the U.S. State Department, is being handled by the Paris office of the U.S. Foreign Liquidation Commission.

Memorial Prizes

A £3,000 memorial to their son, Sgt. Louis Groves, who was killed in September, 1945, has been given to the R.A.F. by Major and Mrs. K. Groves, of Maughold, Isle of Man.

The memorial takes the form of three annual prizes to encourage the problems of the safety of aircraft, and to stimulate research in meteorology and its application to aviation.

Sgt. Groves was a meteorological air observer. He lost his life on a weather sortie, and the memorial has been given in recognition of the meritorious work carried out by flyers engaged in these exacting duties.

£1,000,000 for Airmen

OVER £1,000,000 have been spent by the R.A.F. Benevolent Fund in helping nearly 100,000 cases of distress arising out of the late war.

Lord Riverdale, chairman of the Fund, states that demands in 1946 have been at the highest rate since its foundation. In nine months 23,742 cases were assisted; costing £384,223. Of this sum £16,755 was spent in helping to educate 495 children of deceased airmen and officers.

The Fund was founded by Lord Trenchard in 1919, since when £1,341,058 has been spent in assisting 110,874 cases.

Reappearance

THE initial talk of an attempt on the British-held air speed record by a Lockheed Shooting Star subsided when the Republic Thunderjet's preparations ousted the P-80 from the immediate limelight.

Now that the Thunderjet has, for the time being, gracefully withdrawn from the list of challengers to the Gloster Meteor, there comes more news of Shooting Star aspirations.

Important modifications have been made to the P-80; engine power has been boosted to increase the thrust by 7 per cent, while another 27 per cent is claimed to have been added by the use of water injection. In addition the wing has been given a thinner section and drag further reduced by a much lower cockpit cover and redesigned air-scoops.

The record attempt, we learn, is to be made "within the next few weeks."

Super Flying-bombs

ACCORDING to Air Force sources in Washington, the adaptation of B-29s as guided missiles is being seriously considered by their technical experts.

The suggestion is that a crewless radio controlled Superfortress, loaded with high explosive (or even atomic bombs) could be directed on to a target 80 miles away from the controlling aircraft. A maximum range of 10,000 miles has been mentioned.

The robot aircraft, say the experts, is the best guided missile to bridge the gap between present-day weapons and the V.L.R. rocket.

We can't help feeling that some means of bridging the gap between present-day policies and world peace would be better still!

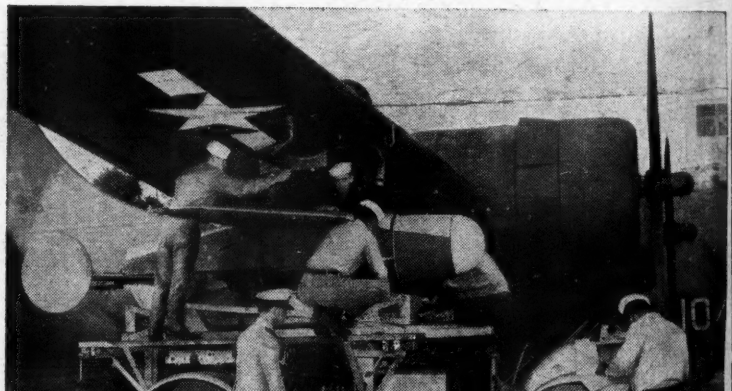
Or would you rather be a fission?

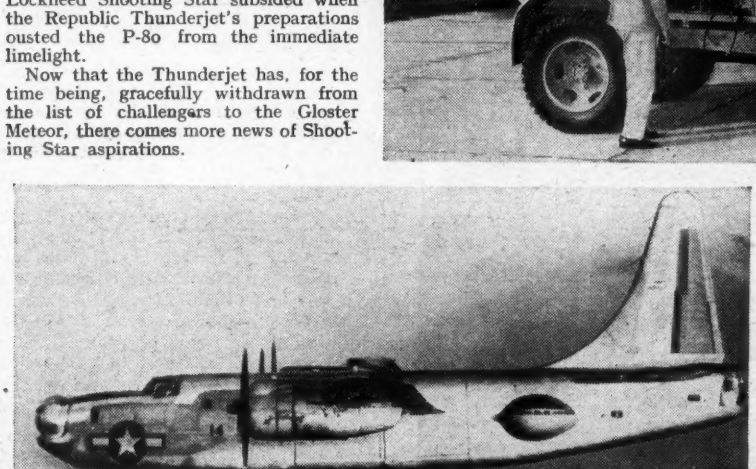
You Can't Go Wrong

WE don't know if U.S. Navy pilots are any more prone than most occasionally to pull the wrong lever and (for instance) lower their whirling airscrews into the deck, but the Research and Development Division of the U.S. Navy Bureau of Aeronautics decided some little time ago to see what could be done towards making such solecisms less likely.

With the help of the Douglas engineering division at El Segundo and some committee work by psychologists, pilots and engineers, they finally hit upon the brilliantly simple idea of shaping control levers like the components to which they are connected, making them move similarly and placing them in the cockpit in positions corresponding as nearly as possible to those occupied on the aircraft by the respective components concerned.

To give one example, the lever con-





"THE BAT" is the name given by the U.S. Navy to their radar-guided glider bomb, now described as "a fully fledged weapon." It can be launched from any suitably equipped aircraft and after release automatically keeps itself on target. It has a span of 10ft and carries a 1,000-lb explosive charge in its 16ft fuselage. (Above) Mounting a "Bat" in the special wing rack of a Consolidated Privateer, and (left) a launch during trials at Chinocteague Aviation Ordnance Test Station. Note that these examples of the missile have differently shaped fins and rudders. An earlier type was used against Jap shipping during the war and sent many thousands of tons to the bottom.

HERE AND THERE

trolling the arrester hook is, in fact, a miniature arrester hook, moves up and down in the same plane, and is situated low down. Flap and undercarriage controls are similarly treated.

There are some obvious limitations, of course, but it's quite an idea.

Building the Brabazon

WITH its span of 230 ft and length of 177 ft the Bristol 167 obviously presents some interesting constructional problems, both in regard to design for production and in the matter of removing the machine from its assembly fixtures when it reaches completion.

How some of these problems are being solved is explained in "Report on the Bristol 167," a special feature in the November issue of *Aircraft Production*, on sale since Monday, October 28th. The article is the first of a series which, appearing from time to time, will describe progress in the construction of this ultra-large aircraft.

FIRST OF THE FIVE: Designed as a target tower for the R.A.F., the Miles Martinet has now been sold, for the first time, to a private concern. Five have been bought by a Swedish charter firm under contract to teach air gunnery to Swedish Air Force pilots

News in Brief

MEMORIAL services for members of the Airborne Forces who were killed in the Second World War are to be held at Westminster Cathedral at 11.30 a.m. and at St. Martin-in-the-Fields at 3 p.m. on Friday, November 8th.

* * *

A Swordfish aircraft is to be given to the National Maritime Museum, Greenwich, to commemorate the war at sea.

* * *

Mr. F. H. M. Lloyd has been appointed sales manager of Hawker Aircraft, Ltd., with effect from Sept. 1st, 1946.

* * *

British livestock strains are in great demand on the Continent at present, and Oxford Down rams, prize pigs, Chinchilla kittens and various breeds of dogs have recently been transported there by air.

* * *

It is expected that almost a year will elapse before flying tests of the Bell XS-1 supersonic aircraft will be carried out at supersonic speeds. Test flights at normal flying speeds, however, are to be carried out almost immediately.

* * *

Mr. E. L. Granville, M.P., has accepted the chairmanship of Portsmouth Aviation, Ltd., who report export orders to the value of over £1,000,000 for their small twin-engined "Aerocar."

* * *

When Mr. H. Holliday retires from the Vacuum Oil Company in December, he will have completed nearly 50 years' service with that concern. He was appointed a director in 1919 and has been managing director since 1933.

* * *

A party of over 700 employees of Dowty Equipment, Ltd., travelled from Cheltenham to London on Saturday, Oct. 19th, to visit the "Britain Can Make It" exhibition. They chartered a special train for the occasion.

* * *

Mr. D. Cairns has been appointed Dunlop district manager in Belfast where he has been acting manager since 1943. Mr. P. C. Welsh continues as the company's regional manager for Northern Ireland.

* * *

A London office at 24, Bruton Street, W.1, has now been opened by the Fairey Aviation Co., Ltd. The telephone number is Mayfair 4448.

* * *

Col. Clarence Irvine, captain of the Superfortress *Pacusan Dreamboat*, which recently flew non-stop from Honolulu to Cairo via the Magnetic North Pole, has expressed the opinion that trans-polar flying is quite practical and that "the establishment of an air base on the Greenland ice cap is perfectly feasible."

* * *

Viking and Tudor I aircraft, and the "Star" series Lancastrians, have adopted Artif-Ice portable refrigerators as standard equipment. They employ solid CO_2 ("dry ice") as the refrigerant, and foodstuffs, etc., can be kept at a predetermined temperature by operation of a control valve.

* * *

A twice-weekly non-stop "Night Express" service between Florida and the West Indies is being started to-morrow (Nov. 1st) by the Caribbean division of K.L.M. The new service is in addition to the daily services calling at Kingston and Port-au-Prince, and reduces the distance by 125 miles.

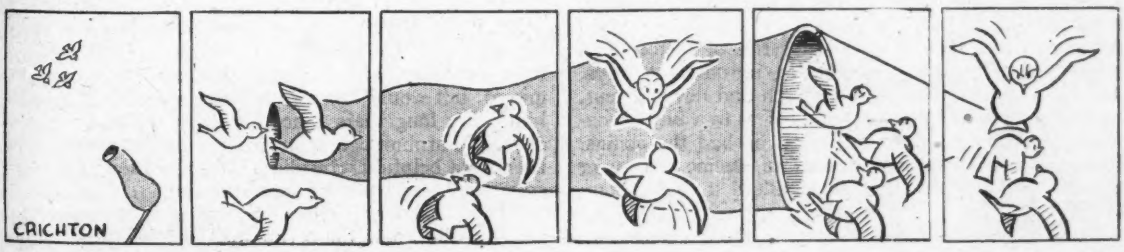
* * *

A large new factory on a 23-acre site on the Kirby Trading Estate, Liverpool, is planned by British Insulated Callender's Cables, Ltd., in order to extend their manufacture of electrical equipment. The plant will have an initial floor area of about 250,000 sq ft and will involve an expenditure of about £600,000.

* * *

Air Vice-Marshal G. A. H. Pidcock, President of the Ordnance Board, Ministry of Supply, has received the U.S. Order of Merit, Degree of Commander, "for exceptional meritorious service as Director of Armament Development." In the absence of the U.S. Ambassador, the presentation was made by the Military Attaché, Gen. Bissell. A.V-M. Pidcock was connected with the introduction to the R.A.F. of the rocket projectile, the "tank-busting" Hurricane, and the "Tallboy" and "Grand Slam" bombs, and other new weapons.

AIRSTRIP . . . . No. 37

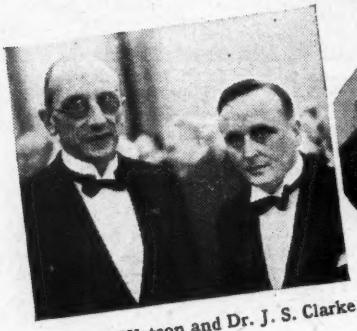


Gas Turbine Collaboration

Technical Committee Holds Its 21st Meeting

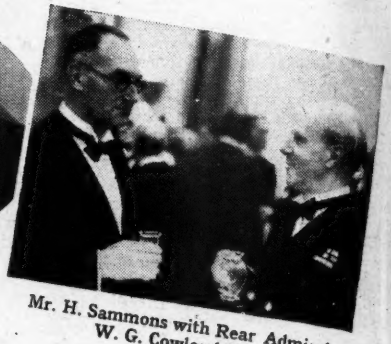
Sir George Nelson (Chairman of D. Napier & Son, Ltd.) and Air Marshal Sir W. A. Coryton.

(Centre) Capt. M. Luby, R.N., with Mr. H. G. Nelson.



Dr. E. A. Watson and Dr. J. S. Clarke.

Mr. G. Geoffrey Smith, Mr. A. G. Elliott and Mr. W. P. Savage.



Mr. H. Sammons with Rear Admiral W. G. Cowland, R.N.

THE great benefit to British technical progress of the co-operative work of the Gas Turbine Collaboration Committee (see last issue of *Flight*) was again stressed by Sir George Nelson, chairman of D. Napier and Son, Ltd., when, as host at a dinner at Claridge's, he welcomed the Committee on the eve of their 21st meeting. Nearly fifty attended, representing the pioneers and technicians in the increasingly important gas turbine field. To Air Comdre. Frank Whittle Sir George paid handsome tribute for Britain's leading position in gas turbine development, stressing that the five years' progress in this new industry was in line with British creative and fundamental work from the time of Newcomen and Watt with steam engines.

British Foresight

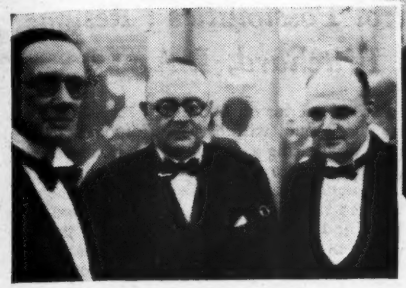
Mr. Arthur Woodburn, Parliamentary Secretary to the Ministry of Supply, proposing the toast of "The Committee," praised the notion of mixing and mellowing ideas, and mentioned the praise of high officials of the U.S.A. for British foresight in co-ordinating research work. He admired the tendency of British engineers in wanting to pull machinery to pieces and improve upon it. The : me urge he had noticed when, with Air Marshal Sir Alec Coryton, he visited the Volkenrode research station near Brunswick to inspect the wind tunnels there. One now saw a series of factories all developing Whittle's original idea in different ways. The Government believed in research and development, he said, and would give encouragement to a boy's technical education if, given the tools, he had the genius. Research was expensive whether in atomic energy or aircraft, and few countries could afford it. The Committee was doing a great work.

Dr. Roxbee Cox (who reverts to the chairmanship in succession to Group Capt. G. E. Watt, who has done valuable work on gas turbines for five years, and is shortly to visit his native country, New Zealand), responding, said that the gas turbine had come to maturity quite early. The Committee was formed in 1941 after the decision to hand all details to America. Good will had made it a success, and the informal discussions had proved most valuable.

Power and Reliability

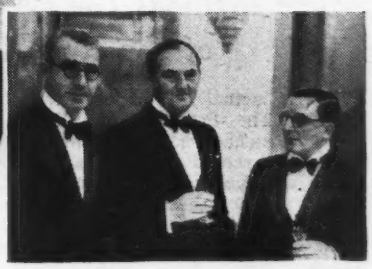
Group Capt. Watt proposed "The Industry," and observed that there has been "more hot air talked and written about gas turbines to date than has gone through them." It has been said that Air Comdre. Whittle handed over this job on a plate—but he reminded the audience that our friends across the Atlantic had the same plateful. In the short span of four or five years British engineers had not only doubled the power of his engines for the same weight but had also improved the fuel consumption by 20 to 30 per cent while increasing the reliable life twenty-fold. That was something to be proud of. The reason? Expert knowledge and teamwork of a very high order, not only in firms, but in a national sense. He had been proud to work with the Committee.

Mr. E. W. Hives, replying, thanked Group Capt. Watt for his work. On the original Committee he had shared their optimism and disappointments. He would be missed, but would take the industry's good wishes with him. For long years, since the Royal Aircraft Factory days of Farnborough, Government establishments had been most helpful and willing. Collaboration in the aircraft field really was of long standing. He thought it fortunate that Dr. Roxbee Cox was able to resume the chair, as he knew the "runs of the Ministries." But



Mr. F. A. Forrd (D.D.E.R.D.), Air Comdre. F. Rodwell Banks and Mr. H. Pearson.

(Left) Dr. H. R. Ricardo. (Right) F. M. Owner.



Mr. A. J. F. Shannon, Prof. O. A. Saunders and J. P Herriot.

Group Capt. George E. Watt.

(Above) Mr. E. Hives with Air Comdre. F. Whittle. (Right) Sir George Nelson receives Mr. Arthur Woodburn and Dr. Roxbee Cox.

Mr. P. Horsfall and Mr. E. Chatterton.

he warned that the Collaboration Committee must not become a mutual admiration society, nor spoon-fed dependants upon Government departments. The industry must be alert and come forward with progressive ideas. War was a common incentive to all, but conditions have changed, and they must review their terms of reference.

Air Comdre. Whittle, pressed to speak, considered informal talks more valuable than sitting in session. He did not want one firm to get ahead; better that all should progress as a team. He mentioned with appreciation the work of Dr. Griffiths, Mr. Constant and the Royal Aircraft Establishment. What had been done was largely the result of the achievements of early technicians and many enterprising people, but originally the materials were not available.

F.A.I. DELIBERATIONS

ALTHOUGH the report on the conference of the Federation Aeronautique Internationale held in London between September 10th and 13th is not yet available, it may be remembered that four incidental committees also met to discuss certain details which were later put before the main conference. The minutes of the first of these—the Commission d'Aeronautique Sportive Internationale (C.A.S.I.)—have, in the meantime, been issued.

In the matter of records the committee decided to appoint another small sub-committee of three members, representing the United States, France and this country, to examine the proposals already submitted by the British delegation. This sub-committee will meet as often as necessary, and a decision will be made, through the C.A.S.I., early in 1947. Revision of the *code sportif* has been decided upon, and the changes will be linked with the conclusions reached by the sub-committee considering the speed, height and distance record regulations. All national aero clubs affiliated to the F.A.I. are asked to forward any useful proposals before January 1st, 1947.

The proposed Bibesco speed trophy contest had already been considered, but it was realized that a contest for absolute speed, which was that in the mind of the donor, Princess Bibesco, would involve considerable expense. Since such could only be held if the prize or prizes were sufficiently large, the matter has been referred back to the donor, and a final decision would be reached in January, 1947. Possibly a contest on more modest lines may be organized.

The regulations covering speed record attempts by "gyroplanes"—i.e., helicopters or autogyros—were also considered. It had previously been suggested that all entrants should make a preliminary flight in an enclosed circuit at a speed not exceeding 35 km/hr, thus ensuring that the aircraft had a reasonable slow-speed performance. The committee decided, in spite of some opposition, to retain the suggested speed figure, though subsequently the general conference agreed on one of 40 km/hr. Other points considered included that of the definition of the word "amateur."

MORRIS AIRCRAFT ENGINES

INSTALLATION drawings of a new 100 h.p. horizontally opposed four-cylinder light aircraft engine have been shown to various aircraft constructional interests by the Engines Branch of the Nuffield Organization. Although the engine is still in the project stage, the design has been completed and prototypes are about to be constructed. Further details will not be released until Sir Miles Thomas returns from his trip to America.

Blind Approach Problems

The Methods Used To-day : Automatic Control Possibilities : Résumé of the R.Ae.S. Lecture by Mr. H. C. Pritchard, B.A.

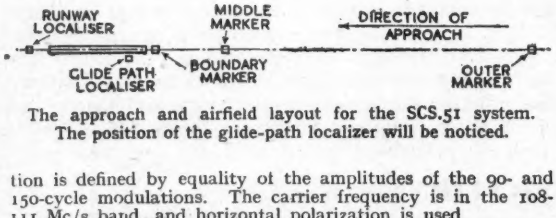
THE actual title of last week's R.Ae.S. lecture was "The Problems of Blind Landing," and Mr. Pritchard explained that he thought that the term "landing" should describe that part of the aircraft's path below a height of about 150ft, while the "approach" should describe the initial path. Since the term "blind landing" may be confusing, and the lecture, in any case, dealt with both approaches and landings, we have preferred to retain, in the title, the more general expression.

In the lecture no attempt was made to cover the work of experimenters in the past, or to describe, for instance, the well-known Lorenz system. Three methods were outlined: the SCS.51, which is in some respects a development of the Lorenz system; the G.C.A. method, using ground radar equipment; and the B.A.B.S. technique, using airborne radar equipment. Mr. Pritchard used the SCS.51 method as an introduction to later ideas which have not so far reached an advanced stage of development.

He explained that the SCS.51 equipment was really a mobile form of the original American C.A.A. system. It involved the use of three main elements on the ground: the runway localizer, to provide information on the plan position of the aircraft; marker beacons, to indicate distance from the runway; and the glide-path localizer, to define the path of the aircraft in the vertical plane.

ALTHOUGH the perfection of the means of instrument approach and landing is only one of several needs for bad-weather transport operation, it is of major interest and importance. The lecture delivered last week by Mr. H. C. Pritchard, B.A., A.F.R.Ae.S., before the Royal Aeronautical Society, covered the situation as it appears at present, and he made some interesting comments on certain items of modern equipment and on possible future developments. The first part of this lecture is summarized here: the remainder will be published next week. Mr. Pritchard is superintendent of the Blind Landing Experimental Unit operated jointly by the R.A.E. and the T.R.E. at Boscombe Down, his opinions, therefore, should be valuable.

The runway localizer radiates two overlapping field patterns with a common carrier, but modulated—one at 90 cycles per second and one at 150 cycles per second. The runway direction is defined by equality of the amplitudes of the 90- and 150-cycle modulations. The carrier frequency is in the 108-111 Mc/s band, and horizontal polarization is used.



The approach and airfield layout for the SCS.51 system. The position of the glide-path localizer will be noticed.

The modulated patterns approach maxima at about 6 deg. from the runway direction and the energy radiated in directions appreciably away from the runway is reduced in order to minimize unwanted reflections from buildings, trees and so forth.

Directional Guidance

Radiation is received by the aerial, which is designed and installed to provide omni-directional reception. The aircraft receiver is a superheterodyne of conventional design, and the 90- and 150-cycle components in the output are separated by band-pass filters, and then rectified; the difference in the rectified outputs is used to actuate a centre zero microammeter. Full-scale deflection of the normally vertical needle is obtained when the aircraft is more than 3 deg. off the runway centre-line. The relation between the current through the meter and the angle made by the line joining the aircraft to the transmitter with the runway direction is linear until this angle exceeds about 3 deg.

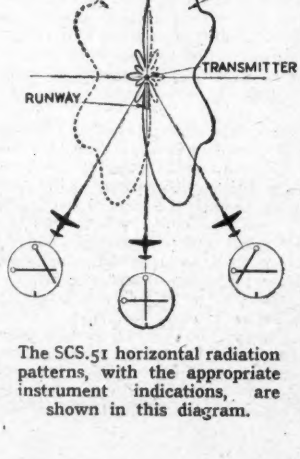
As with the runway localizer, the glide path is defined by two overlapping field patterns, one modulated at 90 and one at 150 cycles per second. The glide-path transmitter is located to the side of the runway, near the touch-down point. Its aerial system comprises one dipole near the ground, radiating a horizontally polarized carrier on about 335 Mc/s and modulated at 90 cycles per second, with a second dipole about 15ft above the ground and radiating a carrier on the same frequency—but modulated at 150 cycles per second. The radiation pattern from the lower aerial is a large lobe formed by the aerial and its ground image; the upper aerial with its ground image produces other lobes and the glide path is defined by the intersection of the lowest of these with the lobe modulated at 90 cycles. The intersections of the latter with the other lobes produce paths of angle too steep to give rise to any uncertainty over the correct glide path.

By adjustment of the heights of the aerials the angle made by the glide path with the horizontal can be varied from 2 deg. to 5 deg.—3 deg. being a common setting. The intersection of the two lobes producing the glide path actually defines a cone with the apex at the transmitter; because this is off the runway, the radiation pattern at very low elevation angles has been modified to give an approximately straight-line glide path for an aircraft when it is over the runway.

The glide-path radiation is received on a dipole aerial, and, as in the case of the runway localizer, the 90- and 150-cycle modulation frequencies are separated, rectified and applied to the centre zero microammeter. Full-scale deflection of the normally horizontal needle occurs if the aircraft is 0.6 deg. above, or 0.3 deg. below the glide path. The relation between meter current and angular position relative to the glide path is linear up to these values.

Marker transmitters are installed along the direction of the runway—normally at distances of 200ft, 4,800ft and 4.5 miles from the approach end. They are modulated respectively at 3,000 cycles per second (unkeyed), 1,300 cycles per second (keyed at 6 dots per second) and 400 cycles per second (keyed at 2 dashes per second). The aircraft normally begins the approach at about 1,000ft, when over the outer marker, and should be at about 50ft when the inner marker is crossed.

The marker aerial system is a linear horizontal radiator aligned with the runway, and its radiation pattern is narrow in this direction but appreciably broader in a direction at right angles. The signal received in the aircraft actuates one of three small lamps in the instrument dashboard, depending on which of the markers is being received.



The SCS.51 horizontal radiation patterns, with the appropriate instrument indications, are shown in this diagram.

Mr. Pritchard thought that the SCS.51 system had been well engineered and that the aircraft equipment was reasonably simple. The total weight of the aircraft installation was about 65 lb and the aerial system was suitable for present-day aircraft. Generally, the system showed a considerable advance on previous schemes and, in particular, provided the first glide path of any practical value.

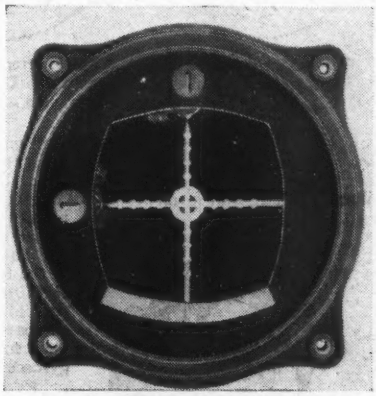
The biggest trouble concerned the effect of reflecting objects. In the case of the runway localizer, although the radiation away from the runway direction was reduced and horizontal polarization used to minimize effects from vertical structures, appreciable

BLIND APPROACH PROBLEMS

energy might be reflected from buildings and trees. This would produce an incorrect difference between the two series of signals.

Results of tests suggested that along the runway direction the position of the aircraft was defined to within about 30 yards—which was amply accurate for the completion of most of the approach. It was even found that deviations of the order of 30 yards might be present for a period of some weeks over a particular stretch, and would then disappear for a time. It appeared that on sites reasonably free from reflecting objects the system gave plan-position information which was good enough for an approach but not sufficiently so for a blind landing.

As far as the glide path beam was concerned, no quantitative measurements had yet been made in this country. The radiation patterns depended fundamentally on ground reflection, and uniformity was necessary since variation would alter the angle of the glide path. Here again, the more important disturbances were those arising from reflecting objects. It should be noted that the height range covered by the glide-path indicator was, with the aircraft close to the runway, extremely narrow; at a height of 150ft, for example, full-scale deflection theoretically occurred when the aircraft was only 15ft below the glide path.



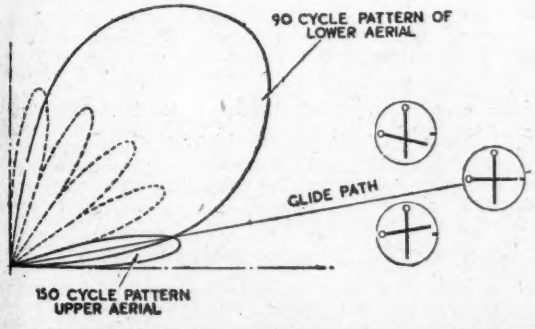
An aircraft cross-pointer indicator used in conjunction with the SCS.51.

Another disadvantage was that continuous indication of distance from the runway was not provided. The importance of this was a matter of opinion, but it was probably easier to control an aircraft automatically if range information was continuously available.

In his paper, the lecturer then described the Ground Controlled Approach system, in which operators watch the movements of the approaching aircraft on radar screens, and the approach controller "talks down" the pilot. Included in this is a search system, which displays on a cathode-ray tube the plan position of all aircraft within a range of 15 miles and below a height of 4,000ft. This G.C.A. system was described in detail, with a complete example of approach "patter," in *Flight* of July 11th, so the description will not be repeated.

G.C.A. Advantages

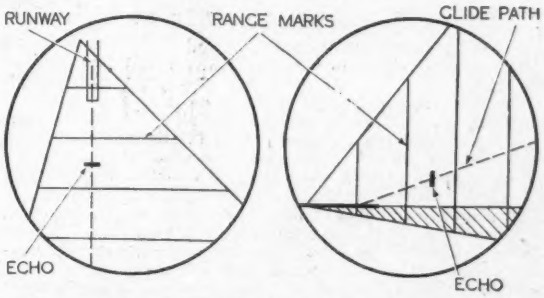
Mr. Pritchard said that the G.C.A. system provided some outstanding advantages. It required no airborne equipment other than VHF or HF communication sets, and relatively little training was required by the pilot. Unfortunately, the present equipment was expensive. Furthermore, since only one aircraft could be handled at a time on the approach path, the system introduced a limitation which would become more serious as traffic increased. It was restricted to approach guidance only, because, when an aircraft was about to touch-down, the elevation beam and its side lobes illuminate ground which was at the same range, and the echo from the former became submerged in ground returns. In addition, the accuracy in determination of aircraft height, required for the actual landing, was unlikely to be achieved by a radar system which had necessarily to be placed a considerable distance from the touch-down point.



The vertical radiation patterns made by the SCS.51 glide-path localizer, and the respective indications on the instrument.

The beam approach beacon system (B.A.B.S.) was the third to be described in the paper. In this a technique known as "secondary" radar is used. The transmission from the aircraft is received by a ground station located at the remote end of the runway, and re-radiated to the aircraft. The aircraft transmits pulses which are received by the ground station and each pulse triggers a transmitter on a slightly different radio frequency after a known short-time interval; the radiation comes from one or other of two slots at the corners of a cavity resonator. These slots are switched at about eight cycles per second by mechanical short-circuiting at the centre of the slot. From one of them a pulse of a length of 5 microseconds is radiated; when the other is opened, a longer pulse, of 12 microseconds, is transmitted. Thus the radiation patterns are obtained and a system is achieved in which the relative amplitude of the short and long pulses should remain constant. The radiation is vertically polarized, the radio frequency is about 200 Kc/s, and the recurrence frequency of the pulse is about 500 per second.

The signals received in the aircraft thus comprise a short and a long pulse whose relative amplitude is determined by the angular position of the aircraft relative to the runway centre-line. The pulse amplitudes are displayed on a cathode-ray tube as shown in the drawings on page 474. The distance B-C on the tube is proportional to the range of the aircraft from touch-down, the indication at B being caused by the pulses transmitted from the aircraft, and those at C by the return pulses. They are displayed along the cathode-ray tube time-base with corrections to allow for the time delay at the ground station and for its distance from an assumed touch-down point. The accuracy of the range measurement is of the order of 500ft.



Diagrammatic representations of the displays on the cathode-ray tubes of the G.C.A. radar equipment. On the left is that for range-elevation and, on the right, that for range-azimuth.

No glide path is provided with the B.A.B.S. system, reliance being placed on the barometric altimeter and on continuous range indication to give vertical guidance. The weight added to the aircraft by the installation is about 120 lb, but it should be added that the equipment can also be used for radar beacon navigation and that this weight is based on a wartime design which could be miniaturized. The "presentation" is normally given to the navigator, who transmits the information to the pilot over the aircraft intercommunication system

Mr. Pritchard said that the airborne equipment for B.A.B.S. was complex, and that its weight—coupled with the fact that the information was presented to a navigator—rendered the system, in its present form, suitable only for large aircraft. It was not anticipated that it would be superior to SCS.51 in the matter of reflection errors.

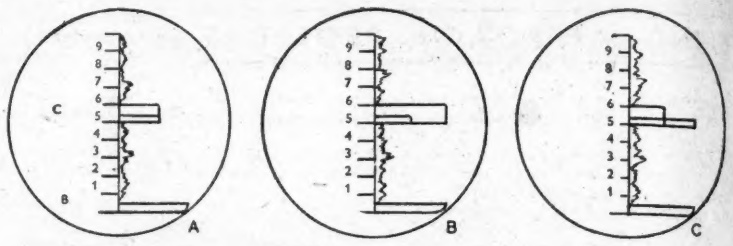
The difficulties of aircraft control under blind approach conditions, he continued, were now well appreciated. With modern aircraft, and particularly in cross-wind conditions, even the most highly skilled pilot was severely taxed—and

BLIND APPROACH PROBLEMS

probably to an extent which made the margin of safety over human failure dangerously small. When the problem of the actual landing was considered his task appeared to be even more onerous with presentation methods now in use, and some alternative approach to the problem seemed to be necessary.

The use of an automatic pilot had frequently been suggested, but little experience had so far been gained in this country. The lecturer suggested, however, that the present-day type of automatic pilot might very reasonably be used for this purpose, and that the adoption of motor-operated control services, which are likely on large aircraft, meant that the main units in an automatic pilot system would in any case become an essential component of the aircraft. (This point, and others connected with bad-weather safety, incidentally, were mentioned by our contributor "Indicator" in his comments in last week's issue.)

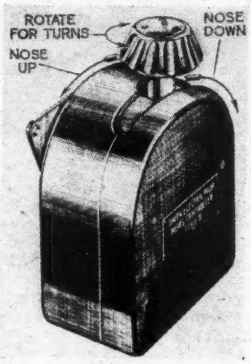
Mr. Pritchard, before outlining some of the problems of automatic approach, gave, in his printed lecture, a brief description of the new Smith electric automatic pilot.



Typical displays on the navigator's screen in the B.A.B.S. system. (A) shows the indications for equi-signal reception; (B) shows the aircraft 5 deg. to starboard; and (C) shows the aircraft 5 deg. to port.

Smith Electric Pilot

The gyroscopes used in this pilot are of the "rate-of-turn" type—i.e., the rotating mass is mounted so that it is free to turn about one axis only, which is orthogonal to the spin axis—hence it can be used to detect a rate-of-turn about the one axis. Three "rate" gyroscopes are required. One detects rate of pitch and causes elevator to be applied; a second deals with rate of roll and actuates the ailerons; and a third responds to rate of yaw and controls the rudder.



The pilot's controller used with the Smith electric pilot.

The gyroscopic units are mounted on a platform, which is pivoted about the aircraft's pitch and roll axes and can be rotated about them by small electric motors. The rate-of-turn is detected by an electromagnetic pick-up associated with each gyroscope, and the signal obtained is amplified and fed to the appropriate control surface motor. Its motion generates a feed-back signal proportional to its rate of rotation; this is used to back-off the initiating signal, thus providing a rate of control-surface rotation linearly related to the rate-of-turn of the aircraft.

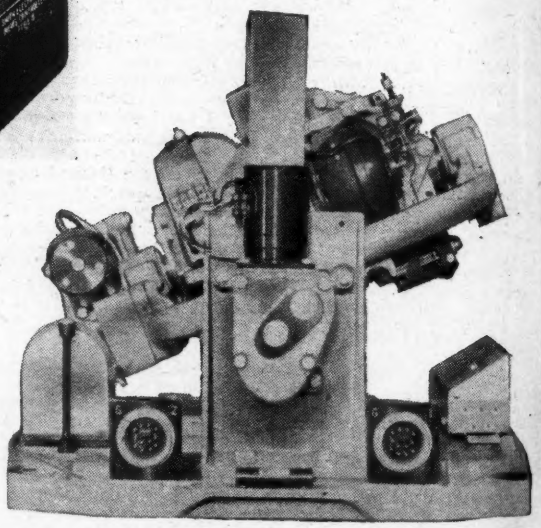
A stable system can thereby be achieved and, by adjustment of the magnitude of the feed-back signal, the ratio of the rate of control-surface movement to the rate-of-turn of the aircraft can be varied. This ratio, which is limited by the inertia of the control-surface motor system and other sources of time lag, determines, to a large extent, the precision with which the aircraft can be controlled, particularly at low air-speeds. With the Smith electric pilot, ratios approaching four can be used, compared with values of about unity which have been common with earlier types of automatic control.

In addition to its function of maintaining straight and level flight, co-ordinated turns and diving and climbing manœuvres can be made through the automatic pilot. A pilot's controller is provided, with an operating handle whose rotation defines the angle of bank of the aircraft and which imposes a rate of pitch if it is moved in a fore-aft direction.

Rotation of the controller handle unbalances a potentiometer network controlling the bank motor on the gyroscope platform; the rate of rotation of this platform is detected by the roll gyroscope, and aileron is, therefore, applied to roll the aircraft in a sense which tends to maintain the platform level with respect to space axes. A potentiometer attached to this platform provides a signal which opposes that initiated by the pilot's controller, and a state of equilibrium is reached when the signals are equal and the platform is level; the aircraft is then rolled through an angle proportional to the rotation of the operating handle. The motion of the platform relative to the aircraft is also used to feed into the rudder circuit a signal which results in the application of the rudder angle required for a co-ordinated turn.

The pitch control operates in a somewhat different manner. The pitch potentiometer in the controller is connected to the pitch motor actuating the gyroscope platform, so that the latter is turned at a rate determined by the fore-aft displacement of the operating handle. This rate is detected by the pitch gyroscope, resulting in the application of elevator to pitch in the aircraft and hence to keep the platform level. Thus, movement of the handle in the fore-aft direction results in a rate of pitch of the aircraft.

Mention should be made of the gravity and compass-monitoring features which are used in the pilot to avoid effects due to imperfections in the gyroscopes; of the sideslip monitor introduced to reduce sideslip during turns at slow speed; and of features which prevent misuse of the pilot.



The gyroscope units in the Smith pilot are mounted on a pivoting platform. The rate of turn in each axis is detected by electro-magnetic pick-ups.

These last include provision for taking over control without any disturbance or "kick" after engagement of the automatic pilot; for preventing engagement until the gyroscopes have run up; and an indicator which shows whether the elevator trim of the aircraft is correctly set.

The Smith pilot is electrically operated, the main supply being required at 115 v 400 cycles per second, with a small amount of D.C. power at 28 volts. It can be adapted conveniently for control by the relatively low-level signals which are derived from radio systems, simply by introducing these signals in the place of those normally applied by the pilot's controller.

[The remainder of Mr. Pritchard's paper will be summarized in next week's issue. In this, he deals with recent experiments in automatic approach, considers various items of equipment which might be of assistance and outlines the general situation for the immediate future. We shall also be giving a precis of the various points raised during the discussion which followed.]

INTERNATIONAL AERONAUTICAL EXHIBITION
PARIS NOVEMBER 1946

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CARIE "ATHM

H.M.S. Th and N Naval Air on Sh

ILLUSTRATED BY " PHOTO

(1.) A quadruple po pom provides an appr priate foreground this view of the fli deck of the *Theseu* showing a Sea Mosquit a Seafire 46 and t Seafire IIIs. To t right in the picture the *Mauretania*, mi a funnel.

AN aircraft carrier is always a popular ship with the public, who are still disposed to regard it as something of a novelty, though carriers have been operated by the Royal Navy for over a quarter of a century. This class of vessel scores over other naval ships in being able to display not only the art of the shipwright but the full range of technical equipment required by aircraft and such intriguing items as lifts, accelerators and arrester gear. Moreover, the flight deck and the hangar provide ample space for promenading.

Thus, anyone who plans a public display in a carrier has a comparatively easy job and need not go far out of his way to "lay on" special exhibits to hold popular interest. The more credit is, therefore, due

(3.) The ship's b battle hon previous vessels e name This badge and re affixed

(4.) Captain T. M. g, C.B.E., R.N. (fourth from me of his L. to r.—Lt. (A) D. en, M.B.E. Deck-landing Contr ; Lt./Cdr Oliphant, R.N.—Lt nt (Flying R. N. Everett, R.N.—Corr (Flying) ; Cdr. D. Jones, D.S Bar, R.N.—Cdr (Operatio

(5.) Polishing the and Sea N (two Merlins) in for an afte inflators.

(6.) The 1st Lieute ng) watch on the Vampire. foreground barrier for arrest which r

ARRIER "THESEUS" AT HOME"

S. Th and New Air on Show

BY " PHOTOGRAPHS

2. The Griffon-gined Barracuda torpedo bomber which differs in nose, ng and tail design om its predecessors

4

to those who organized the unusually elaborate show aboard H.M.S. *Theseus* which for a week recently lay in Gladstone dock, Liverpool, open to public inspection on behalf of naval charities. The hangar resembled a small S.B.A.C. Static Display—by no means "miniature," being able to accommodate three squadrons of fighters—and ranged on deck, as later described, were specimens of some of the latest British naval aircraft, specially assembled for the occasion.

H.M.S. *Theseus* is a Light Fleet Carrier of the *Colossus* class. Laid down in 1942 in the yard of the Fairfield Shipbuilding and Engineering Company, Ltd., at Govan on the Clyde, she was launched by the late Lady Somerville on July 6th, 1944. Commissioned on January 9th,

ip's h battle honours of ssels h e name *Theseus*. and e affixed to the

T. M g, C.B.E., D.S.O., from some of his officers. (A) D en, M.B.E., R.N.— g Comdr ; Lt./Cdr. R. L N.—ant (Flying) ; Cdr. erett, R.N.—Commander Cdr. D Jones, D.S.C. and .N.—Co (Operations).

g the and Sea Mosquito s) in for an afternoon's inf rs.

Lieu ng) watches work mpire. foreground is the arres which miss the

6

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Scientific A14

CARRIER "AT HOME"

1946, she is thoroughly up to date, and is the first large ship to go into service with brightly painted mess decks.

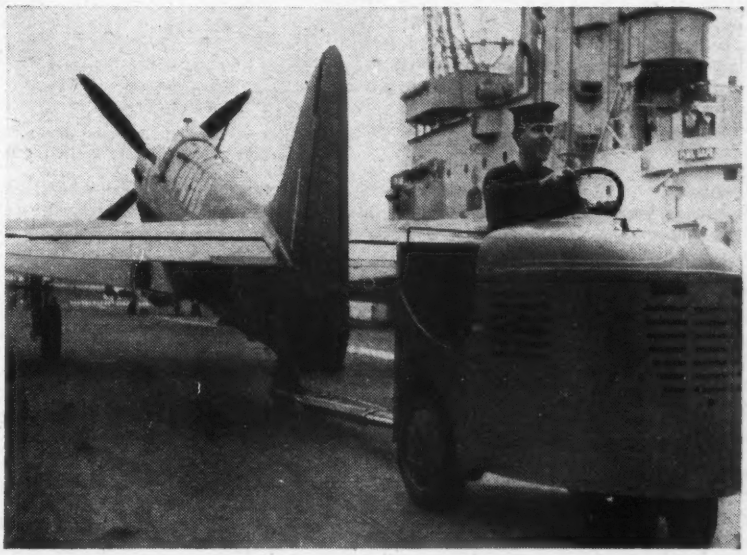
The normal complement of aircraft is three squadrons of twelve fighters. Nine hundred officers and men are carried, and although the ship mounts no heavy armament she is generously provided with Bofors and multiple-pom-pom high-angle guns.

In command of the *Theseus* since January 9th, 1946, Captain T. M. Brownrigg, C.B.E., D.S.O., R.N., has a distinguished war record. From July, 1939, to June, 1942, he was Master of the Fleet to Admiral Lord Cunningham of Hyndhope, at that time C.-in-C. Mediterranean. He was Admiral Cunningham's Deputy Chief of Staff (Plans) from July, 1942, to September, 1943, during which time he acted as Naval planner to General Eisenhower for the North African and Sicilian landings. He attended the Quebec and Casablanca conferences, and from October, 1943, to September, 1944, commanded the cruiser *Scylla*. Captain Brownrigg was Flag Captain to Admiral Vian in Normandy, and before taking up his present appointment commanded the Royal Naval Air Station, Rattray.

During nine months of service *Theseus* has been employed as a Training Carrier. Her programme has embraced four distinct varieties of training apart from the initiation of the many new entries among her own ship's company.

First, she has undertaken "Squadron Training" which entails the embarkation of Naval squadrons for exercises at sea. Last May, for example, the ship visited Bergen, in Norway, with a squadron of Seafires, and on passage was able to carry out many useful exercises.

In "Deck-Landing Training," second of the ship's recent commitments, new pilots are given instruction and practice in landing on a carrier's deck, for a year previously having been under training ashore. During training in deck flying the pupil is directed on to the deck by the D.L.C.O. (Deck Landing Control Officer). He must make eight good landings to satisfy the Commander (Flying), who then assesses his ability as "Exceptional," "Above Average," "Average," or "Failed." In the last case he may be recommended for more training ashore before attempting to requalify. One learnt aboard *Theseus* that the percentage of fails is encouragingly low, although a Training Carrier has her full share of spectacular incidents. About six months ago, for example, a pilot under training completed his first landing with his aircraft perched on the ship's funnel. He dropped into the sea and was picked up by the attendant destroyer.



A Fairey Firefly Mk. IV fighter-reconnaissance aircraft (Rolls-Royce Griffon) is ranged on the deck of the *Theseus* for display to the citizens of Liverpool.

Another aspect of the programme carried out by *Theseus* has been the training of Deck Landing Control Officers for the Fleet, each pupil D.L.C.O. (or "batsman" as he is descriptively termed, because of his stock-in-trade, which resembles a pair of table tennis bats) is under the supervision of a fully qualified instructor. For the training of D.L.C.O.s Seafires and Fireflies are supplied by a squadron from the Naval Air Station at Lossiemouth, in Scotland. The pilots provided have long experience in deck landing and are known aboard *Theseus* as "clockwork mice." Two aircraft are used during this form of training and an interval of only fifteen seconds between landings is often accomplished. As soon as it is released from the arrester wire each machine is "waved off" by a pupil. It is greatly to the credit of the instructors aboard *Theseus* that on numerous occasions over two hundred landings have been made in a day.

Special training is given to Captains Designate of aircraft carriers, Fighter Direction Officers, Air Engineer Officers and others who are embarked from time to time for courses and to acquire experience of conditions in a carrier at sea.

A rating adjusts the contra-rotating airscrews of a Supermarine Seafire 46 single-seat Naval fighter (Rolls-Royce Griffon). The Seafire 46 is one of the most recent types used by Naval aviation.

CARRIER "AT HOME"

The organizers of the *Theseus* display went to great pains to secure specimens of aircraft representative of the new equipment of Naval Aviation. It was regrettable that no Sea Fury, Firebrand or Sea Hornet could be included and that the Vampire was not of the Naval variety, but it was a commendable feat to have secured a standard R.A.F. Vampire, Sea Mosquito, Seafire 46, Barracuda V, Barracuda II, Firefly IV and three Seafire III fighter-trainers. These elderly Seafires were recklessly exposed to the wrenching grasp and hammering tread of Liverpool youth. The Barracuda II was shown complete with torpedo and ranged on the accelerator, or "booster."

This Fairey Barracuda was shown, complete with torpedo, ranged on the accelerator, or booster, at the forward end of the deck of H.M.S. *Theseus*.

In the hangar, its airscrew boss framed by a wreath, was what we were assured is *positively* the last Swordfish. This battered "Stringbag" challenged in drawing power the glistening Derwent and Merlin power plants, the comprehensive display of air armament (including bombs, guns, ammunition, rockets and a gyro gun sight) and the section devoted to safety equipment and embodying an airborne lifeboat, parachutes, dinghies and survival packs. Fire fighting and photography had their due show. The "asbestos man" had a brother on the flight deck, equipped as a batsman.

The electrical layout of a carrier is a marvel of planning. The total dynamo power available in *Theseus* is 1,600 kilowatts, supplied by five main dynamos which, together with the main switches, are remotely controlled by 133 push buttons, each with its own indicating light. Should the ship's electrical supply be interrupted, 300 automatic emergency lanterns are available.

Two other warships—the "S" class submarine H.M.S. *Saga* and the "R" class Fleet destroyer H.M.S. *Rapid*—were also at Liverpool. *Rapid* is now employed as an attendant destroyer to aircraft carriers and on several occasions has worked in company with *Theseus* on training cruises.

American Newsletter

Airline Criticisms and Justifications : What the Private Owner Wants: The Long-distance Record Constant-speed Rotors?

By "KIBITZER"

AIR transport in the States has been taking some harsh criticism of late. An outspoken article in *Fortune* touched off a powder keg and everybody who had a grouse joined in. The trouble is that the tremendous increase in passengers and aircraft traffic during the last ten months has not been matched by an equivalent increase in the ground and air-handling facilities. Consequently, if anything goes wrong at all, there is no margin for error and chaos can reign supreme. The airlines did a wonderful job of selling themselves and their new and larger equipment to the public, who were only too glad to travel by air, but airport and other facilities, many of which are not controlled by the airlines, simply weren't up to the job.

Delays can start right at the ticket counter and, although the unfortunate ticket agent does his, or her, best, it's quite usual to wait twenty minutes or half an hour while making a booking. Baggage handling is poor, and if flights are held up or cancelled the situation soon gets out of hand, particularly at the smaller stopping places which were never designed to take care of heavy traffic. An enforced stop overnight is something to be avoided, as there are never any hotel rooms anywhere.

The airport facilities themselves, both for loading the passengers and for handling the machines on and off the ground, are out of date. Restaurants, lounges, waiting-rooms, ticket offices, lavatories and even ground transport are very often hopelessly inadequate, and a few are just disgraceful. Under autumn weather conditions some of the airports are finding it difficult to handle the increased number of landings and take-offs, and what is going to happen when the really bad weather comes along, goodness knows.

All this is, in a way, bad luck on the airlines, but a great deal of it is their own fault. Much of the trouble arises from the national characteristic of never really planning ahead. A British weekly, in an informed article on the general situation over here to-day, called America, "The Unplanned Society." This criticism has much truth in it, as, for some reason, improvization is considered a finer attribute than careful foresight. A policy of getting an immediate dollar return is often more acceptable than a long-range, well-thought-out and, perhaps in the end, more profitable plan. The result is that confused situations occur with considerable regularity in all sorts of businesses. In this case the air operators are suffering, since the railways have lost no time in cashing in.

Things won't improve much until terminal buildings are redesigned, airports are modified and increased in number, additional blind-flying aids are installed, the standard of comfort and passenger and baggage handling is improved and sleepers are reintroduced on to the cross-Continental routes. Furthermore, the present monopolistic road transport concessions to and from airports are doing the airlines harm. Not to be able to pick up a cab because of a monopoly, or to be forced to ride into town in an overcrowded and uncomfortable limousine, does not make for good business.

Although the British picture cannot yet be compared to that in the States, there are lessons to be learnt over

here, and it is worth giving sympathetic attention to the American's troubles.

* * *

Some interesting statistics have been published recently on private ownership in the States. Apparently the American owner flies an average of 183 hours a year, but the weather makes quite a difference to him, inasmuch as the annual average in the north-eastern States is 156 hours, but it is 205 in the south-western ones. Most fly for pleasure, but quite a number use their aircraft for non-aviation business. This latter category will probably increase rapidly now that the farmers of the mid-west are using aircraft in their daily work. In any case the hours flown for pleasure add up to almost two million per year, and this figure would be greater if the average owner had more time—for 60 per cent of them say that they would have more hours in the air if they were not so busy. Only 15 per cent admit that their flying is curtailed by cost, which is a remarkably low figure, and much less than one would have thought. But America, to-day, is a rich and expensive country, and there is money to be spent—for as long as it lasts.

A survey has also been made of the type of aircraft that is desired by the average person—whether private owner or non-flyer—and this is not without interest. 41.8 per cent wanted a four-seater and 21.5 per cent a two-seater. Three seats and five seats split the balance. So far as cruising speed goes, much the largest percentage wanted a figure of between 120 and 150, with 80 to 100 m.p.h. the next in popularity. Very few seemed to want to go between 100 and 120, or 150 and 180; 18 per cent, however, wanted to do more than 180 m.p.h. In cruising range 39.5 per cent of the people wanted to go from 350 to 500 miles in one hop, and 26.1 per cent voted for 300-350 miles.

In the price range 22 per cent would put down 1,500 to 2,000 dollars and 30 per cent would spend 2,000 to 3,000 dollars. Lower or higher prices did not seem to be very interesting to the general public. It should be remembered that this was an overall survey, and the ordinary man in the street does not really know a great deal about flying other than what he reads in the daily press. But the rather conservative, middle-of-the-road figures obtained should give manufacturers something to think about.

* * *

The long-distance record put up by the U.S. Navy on a P2V Lockheed Neptune was a magnificent feat. A distance of 11,236 miles will be a hard one to beat, and everybody concerned with the flight deserves the highest praise. The published details give the take-off weight as 85,500 lb (the maximum permissible design A.U.W. is believed to be about 58,000 lb for this aircraft), and the fuel load was 8,600 gallons. The take-off was assisted by four Jato units which gave about 4,000 lb of additional thrust, and during the flight, which lasted 55¼ hours, weather conditions appear to have been bad, with an average head wind of about 11 m.p.h. and some heavy icing conditions as well. The average speed was 203.4 miles per hour. The U.S. Navy should be proud of this effort, and rightly so.

* * *

The Cornell Aeronautical Laboratory at Buffalo airport has produced a constant-speed rotor control for helicopters. Both the Bell Aircraft Corporation and the United States Army Air Forces are said to be adopting it. If this is proved as satisfactory, it will mean much to the advancement of the helicopter. But this will not be the end of the road, by any means. Some recent accidents over here indicate that there is still a great deal of structural and aerodynamic research work to be done on rotor-blade design itself. Although no thinking person can fail to realize that the helicopter is probably the only answer to certain classes of flying, it may be several years before it is as reliable as the modern light aircraft is to-day.

* * *

A trickle of news concerning the Lockheed-Menasco engine keeps coming out of California. Apparently this engine may be expected to run as a complete unit some time this year and although the figures for consumption and compression that are being linked with it are most certainly optimistic, it may prove to be a most interesting and advanced design.

Talking of engines, there is another rumour that the engine fitted to Tex Johnson's winning Airacobra at the Cleveland Air Races was not an Allison after all, but was a Packard-Rolls. Whatever it was, the horse-power it developed must have been considerable, as, despite the very obviously high wing-loading of this machine, the take-off was quite remarkable. If it was an Allison, that company did a good job in extracting every available bit of power, and if it was a Rolls, someone did a pretty astonishing piece of redesign in order to hitch it up to the shaft drive. The answer, either way, would be interesting.

FUEL CONSUMPTIONS

IN our issue of September 12th, the maximum continuous cruising power figures given on page 279 for the Bristol Hercules 630 and Centaurus 57 were for absolute conditions and were not therefore in line with the weak-mixture figures given for other engines included in the review. For true comparison, the weak-mixture figures for these power units are as under:

	Centaurus 57	*Hercules* 630
Max. cont. cruising power:	1,790 b.h.p.	1,330 b.h.p.
R.P.M.:	2,300.	2,400
Boost:	2.5 lb/sq in.	3.25 lb/sq in.
Altitude:	11,000ft.	9,250ft.
Fuel consumption:	0.475pt/b.h.p./hr.	0.465 pt/b.h.p./hr.

Incidentally, the maximum continuous cruising fuel consumption figure of 1.517 pt/b.h.p./hr given for the Rolls-Royce Merlin 620 was misprinted and should, of course, have been 0.517 pt/b.h.p./hr.

FORTHCOMING EVENTS

Nov. 2nd.—British Interplanetary Society; "High Speed Flight," T. R. F. Nonweiler, St. Martin's Tech. Sch., Charing Cross Road, W.C.2. 6 p.m.

Nov. 6th.—R.Ae.S., Reading branch: film loaned by High Duty Alloys Ltd.

Nov. 7th.—Aerotech Flying Club, No. 1. "Rotating Wings," R. G. Robertson, Fairey Canteen, 8 p.m.

Nov. 9th.—Helicopter Association of Great Britain: "Helicopter Research and Development," Mr. C. G. Pullin; Manson House, 26, Portland Place, London, W.1.

Nov. 9th.—R.Ae.S., Graduate and Student Section: Visit to Percival Aircraft and Napiers, Luton.

Nov. 12th.—R.Ae.S., Belfast branch; "Future Development of Aircraft for Civil Aviation," N. A. White; College of Technology.

Nov. 15th.—Paris Aero Show.

SABRE-FURY PERFORMANCE

SOME detailed performance figures for the Hawker Fury I single-seat fighter fitted with the Napier Sabre VII N.S.93S.M. engine (water/methane injection) are now available and are set out below. Data for the Centaurus-engined Sea Fury were given in *Flight* of October 10th, 1946.

Standard Altitude (ft)	*True Air Speed (m.p.h.)*	*Rate of Climb (ft/min)*	*Time to Height (min)*
0	419	5,240	0
3,000	433	5,160	0.60
8,000	457	4,580	1.65
13,500	460	4,270	2.91
18,500	483	3,400	4.15
24,000	478	2,200	6.00
30,000	453	1,280	9.5

Take-off (Still Air)

Weight (lb)	*Ground Run (yd)*
11,500	265
12,000	295
12,500	335
13,000	375
14,000	465

With two 90-gallon drop-tanks the max. still-air range is 1,790 miles. If the tanks are jettisoned before combat the radius of action is 605 miles at 10,000ft.

ATOM-BOMB CARRIERS

IT has been officially announced in America that as well as the Boeing B-29 Superfortress all large bombers on order for, or projected for, the U.S. Army Air Forces will be capable, with slight modification, of carrying an atomic bomb.

No details are available of the method of carrying it.

THE LUFTWAFFE AND ITS FAILURE

A.V.-M. Elmhirst Tells of Lack of Experience and Influence at "High Levels" : Optimism and Over-confidence : Period of Complacency : Hitler's Interference : Fighter Shortage

SPEAKING at the Royal United Service Institution on Wednesday, October 23rd, Air Vice-Marshal Sir Thomas Elmhirst, K.B.E., Assistant Chief of the Air Staff (Intelligence) reviewed the shortcomings of the German Air Force from 1939 until final defeat. His lecture is summarized as follows:

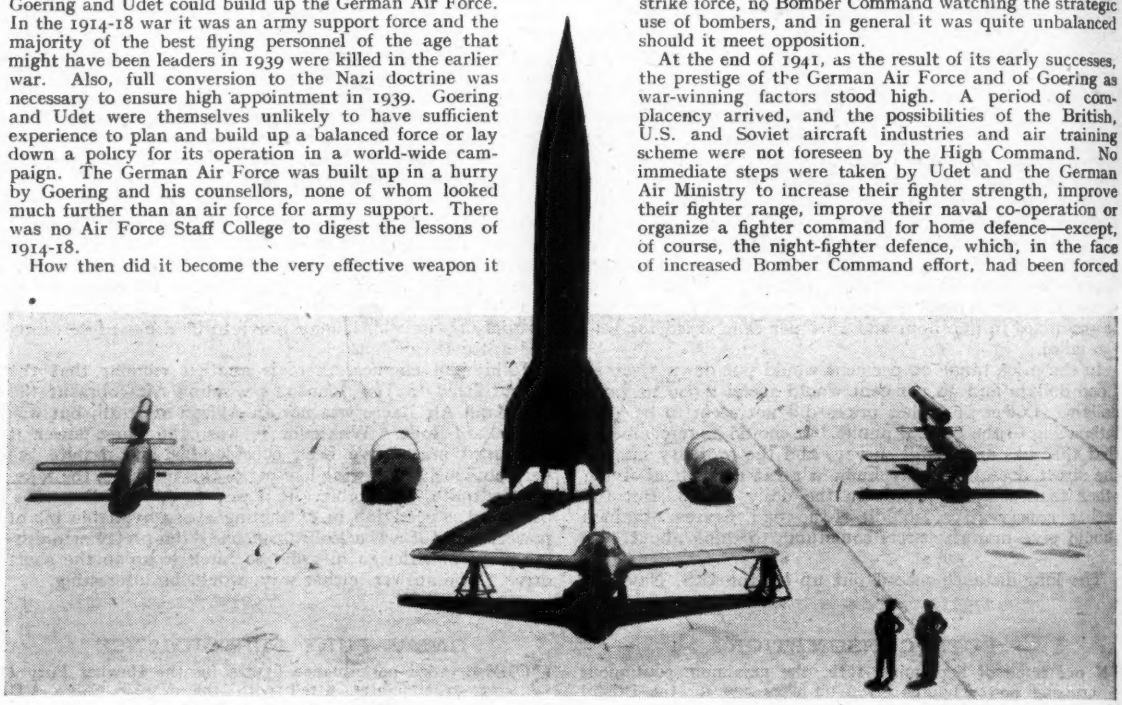
There was little of either tradition or experience on which Goering and Udet could build up the German Air Force. In the 1914-18 war it was an army support force and the majority of the best flying personnel of the age that might have been leaders in 1939 were killed in the earlier war. Also, full conversion to the Nazi doctrine was necessary to ensure high appointment in 1939. Goering and Udet were themselves unlikely to have sufficient experience to plan and build up a balanced force or lay down a policy for its operation in a world-wide campaign. The German Air Force was built up in a hurry by Goering and his counsellors, none of whom looked much further than an air force for army support. There was no Air Force Staff College to digest the lessons of 1914-18.

How then did it become the very effective weapon it was in the last three years of war? The reason was that in the few years before the war Goering made it a *corps d'élite*. There was no Treasury limitation over Goering; he could get the best of everything, both men and equipment. At its peak the German Air Force included just under 3,000,000 men, 200,000 of whom were in the signal service.

The seed from which final failure grew was the overall control of the German armed forces. From the early months of 1942 Hitler was Commander-in-Chief of all the Services and from his field Headquarters exercised such command at most stages in the war. Hitler himself became Commander-in-Chief of the army and there were separate Commanders-in-Chief of the Navy and the Air Force, but on a level with the Commanders-in-Chief was the "O.K.W.," a Supreme Headquarters Staff who were responsible to Hitler for the strategic policy of the war and the overall planning of intelligence. Here was a brilliant military staff of some 700 officers, but their minds were tuned to land warfare. The highest-ranking Air Force officer among them being a Group Captain. The German Chief of Air Staff could have but little influence with the Supreme Headquarters Staff with one Group Captain as his representative. His only hope when he had a policy was to get Goering to bully Hitler. After the first two years of war Goering sat back and the German Air Force accordingly took a very back seat in the Councils of State that directed the German war policy.

The G.A.F. went into the war an exceedingly strong, well-trained and equipped tactical air force for the support of an army for a European land war. Goering may have had other ideas, but Hitler and the Supreme Command Staff had not. There were no functional commands for studying the use of air fighting in home defence and it had no night fighters. It had no Command for operating with the Navy, no shipping strike force, no Bomber Command watching the strategic use of bombers, and in general it was quite unbalanced should it meet opposition.

At the end of 1941, as the result of its early successes, the prestige of the German Air Force and of Goering as war-winning factors stood high. A period of complacency arrived, and the possibilities of the British, U.S. and Soviet aircraft industries and air training scheme were not foreseen by the High Command. No immediate steps were taken by Udet and the German Air Ministry to increase their fighter strength, improve their fighter range, improve their naval co-operation or organize a fighter command for home defence—except, of course, the night-fighter defence, which, in the face of increased Bomber Command effort, had been forced to develop considerably from the summer of 1940 onwards.



An A-4 ("V-2") war rocket, Me 163 rocket-propelled intercepter and Fi 103 ("V-1") flying bombs—all ingenious weapons developed late in the war. The flying bomb on the right of the picture is a piloted type and was not employed on operations.

Why did the German Air Force not win the Battle of Britain? It was a big force, having 2,600 aircraft with heaps of reserves and very high morale. The operational direction was good at the start, but there was blind optimism, over-confidence, and a lack of good intelligence of our fighter command organization. It was soon found that unescorted bombers suffered crippling losses and that Stukas could not survive at all. It was also found that the fighters had not sufficient endurance to escort the bombers to London and back if they were engaged and had to fight for it. The G.A.F. found that our fighter pilots were a well-trained team with high morale, and that they were good shots, brilliantly led and mounted, and brilliantly controlled from the ground for raid interception.

Politics and Strategy

The G.A.F. was an unbalanced force for such a campaign, the implications of which had not been studied, and at a critical moment Hitler interfered. The original plan was to destroy R.A.F. aircraft on the ground by bombing their airfields, but half-way through the battle this aim was changed. Hitler, irritated by the first R.A.F. night bomber raid on a Berlin suburb on August 27, ordered the German bombers to avenge themselves on London, and attacks on airfields ceased. The

THE LUFTWAFFE AND ITS FAILURE

Germans, not trained for night strategic bombing, carried out their attacks well, but there was no continuity of aim.

The turn of the tide came in 1942. The German Air Force was extended. There were the Norwegian, Balkan, and Cyrenaican fronts, the home defence front at night, and the Western front. Bomber Command were stepping up their raids, and Coastal Command were hampering the U-boat movements to and from the Biscay coast. The 100 per cent reserves of aircraft and crews with which the German Air Force had started the war were expended and the shortage of fighters that had showed up in the Battle of Britain still existed. The period of complacency of 1940-41 was having its effect.

Worse was to follow at the end of 1942 and the spring of 1943. With the Africa Corps, short of petrol, in full retreat, and in difficulties in Tunisia, and German Army surrounded at Stalingrad, Hitler and the Supreme Command ordered their Air Force to carry petrol and supplies and at the last to evacuate the beleaguered forces. The operation had to be carried out at any cost and the cost was literally hundreds of German aircraft and their experienced crews. Goering himself stated that the Stalingrad and Mediterranean operations at the end of 1942 and early 1943 were the death-knell of the German bomber force.

In 1943 R.A.F. Bomber Command forced the German Air Force to form its first functional Command, Air Fleet Reich, and to charge it with the air defence of Germany.

A "last-ditch" effort to counter the Allied bomber offensive —the Bachem "Natter" (Viper) with Walter bi-fuel rocket.

The U.S. 8th Air Force had commenced its daylight attacks, but it was not until the summer of 1943 that the Germans realized what these attacks were going to mean for them. The German Air Force began late in the year to fall into discredit among its own people and lost confidence in itself and its ability to stop the bombing of the Reich. Goering's prestige declined and personnel at lower levels were losing confidence in their superiors and the High Command.

Things became worse in 1944, just when the night-fighter defence was again getting into its stride after the reverses of 1943. The 8th and 15th U.S. Air Forces, accompanied now by their escort fighters, began their heavy day attacks on aircraft production factories and oil. The appearance of the U.S. long-range escort fighters over Berlin took the Germans by surprise and at first they would not believe it. When convinced, Goering remarked that the war was lost.

The Me 109 was a pre-war fighter which, continually modified, remained in service throughout the war. The late G series is illustrated.

With regard to the German Air Force's failure to hinder the invasion of Normandy, the German plan was dislocated first by Hitler and later by Allied bombing attacks. A force of nearly 1,000 aircraft, "ship strike" and bombers, was planned and an air corps was brought from Italy. This planned force was not, however, realized owing to the interruption of the bomber programme in favour of concentration on fighters, and, by order of Hitler, to a frittering away of the bomber force in the night raids on London and other cities.

History will record as the German Air Force's biggest failure its complete failure to fly reconnaissances during the last days before the invasion of Normandy. The reconnaissance forces were there, in France, but the R.A.F. succeeded in stopping all but an occasional cover of eastern channel ports.

End In Sight

August, 1944, was the black month for the German Air Force. On August 11, owing to fuel shortage, restrictions were ordered on all flying activities other than those operations connected with the interception of raids penetrating into Germany. From this day the German Air Force in the west was practically eliminated as a factor of military importance in land operations. In September, 1944, 70 per cent of the whole of the German Air Force was attempting unsuccessfully to protect their oil industry. In the end this resounding failure, besides grounding the air force, immobilized the Army and Navy.

The German aircraft industry was in a healthy state at the beginning of the war, but even after the Battle of Britain it remained on a pre-war level. A short war was expected and it was not until 1941 that expansion was started and not until the end of 1943 that a real effort was made to produce day fighters in sufficient quantities Of types of aircraft, the Germans, in general, finished the war with modified models of those they started with. We were told that the reason why no four-engined bombers were put into large-scale production was that they would have been of no use for day support of the armies. When the need of long-range heavy bombers was later seen, it was too late, and all production was then concentrated on day and night defence fighters. The heads of the German Air Ministry repeatedly called to Hitler and the O.K.W. for more priority of the country's industrial effort for aircraft production for their home defence, but they could not get it until July, 1944, when Allied bombers had already virtually destroyed their fuel industry.

THE "MIXED" MARTIN

ANOTHER American example of the application of "mixed" power plants is announced in the new experimental Martin long-range patrol aircraft, the XP4M-1, which mounts a piston-type engine and a turbo-jet unit in a common nacelle on each wing. The aircraft thus has the outward appearance of a more-or-less conventional twin-engined type in contrast with the British Nene-Lancastrian in which the jet units replace the outer piston engines in a normal four-engined lay-out (see *Flight*, September 26th).

The new Martin, which has been developed by the U.S. Navy, is claimed to possess "a speed that in the past has been reserved for fighter attack aircraft" when using all four power plants. The development follows on the earlier success with the Ryan Fireball fighter which has been in squadron service with the U.S. Navy for some time, and which is fitted with a radial piston engine in the nose and a jet unit in the fuselage behind the pilot's cockpit.

A number of much earlier German experiments and projects with "mixed" power plants was reviewed in *Flight*, October 10th.

DUTCH AIRCRAFT DEVELOPMENT

THE Dutch government, acting on the advice of the committee set up for investigating the possibilities and conditions for the reconstruction of the Dutch aircraft industry, has decided to give its financial support to the development of new aircraft types. In the name of the Minister of Transport, the Government adviser for the aircraft industry, Mr. Th. P. Tromp, inaugurated the Netherlands Aircraft Development Board last July.

CIVIL AVIATION NEWS

Accident Reports to be Published : Viking Tour : I.A.T.A. Meeting Opens

AFRICAN VIKING : One of the Vikings ordered by Central African Airways.

ACCIDENT ANALYSIS

ACCIDENTS to aircraft, when recorded over a period, are difficult to analyse owing to the constantly changing conditions. Straight comparisons, no matter what yardstick is chosen, are often misleading and sometimes entirely false. The Ministry of Civil Aviation have recently produced notes on and statistics of accidents to aircraft on the regular air services flown by United Kingdom operators since 1925. The figures are interesting, but the comparisons and deductions might easily create a wrong impression. The figures for some of the more interesting years are reproduced.

ACCIDENTS ON REGULAR AIR SERVICES FLOWN BY UNITED KINGDOM OPERATORS

Year	Aircraft flights	Aircraft mileage	Passengers carried (individuals)	Accidents Resulting in death	Passengers		Crew	
					Killed	Seriously injured	Killed	Seriously injured
1946	Not available	24,000,000	270,000	4	29	1	11	2
1945	65,200	27,328,000	251,300	—	—	—	—	—
1938	95,100	14,331,000	222,200	4	12	4	8	1
1933	23,200	2,638,000	79,100	2	20	—	5	—
1932	9,100	1,793,000	48,200	—	—	—	—	—
1925	4,000	806,000	11,000	—	—	—	—	—

In a second table the Ministry has made comparisons over five-year periods to indicate the trend of safety. The number of accidents per million aircraft miles was cited as an example. In the first five-year period, from 1926 to 1930, the figure was .82, whereas from 1941 to 1945 it had fallen to .19. Similarly, there was a decline in passenger fatalities, per hundred-million passenger-miles from 54 to about 10.

But both of these figures may be largely accounted for by the greater average distances flown per flight in the later period. For example, the average in 1926 was 188 miles and, in 1945, 420 miles. The decline in passenger-mile fatalities is also less significant if it is appreciated that each flight in 1945 carried half as many passengers again as any one flight in 1925. Coupled with this, it must surely be borne in mind that over this period of twenty years there have been great advances in engineering and airframe construction and the modern aircraft should be more reliable than its predecessor.

The most startling revelations concern the number of aircraft *flights* per fatal accident and the number of passengers carried per passenger killed, which are as follows:—

	1946	1941–45	1936–40	1931–35	1926–30
Aircraft flights per fatal accident	Not available	14,200	15,800	22,100	6,200
Passengers carried per passenger killed ...	9,350	9,600	23,400	11,900	7,700

Each set of figures shows a sharp and encouraging rise in the 1930 to 1940 period, but the decline from 1940 to the present time suggests that we are, once again, approaching a danger period. Most encouraging are the totals, and it is perhaps surprising that the number of people killed during the past twenty years amounts to only 331, of which 205 were passengers and the remainder crew. That is a figure which compares well with the toll of life in other spheres of transportation.

ACCIDENT INVESTIGATIONS

IN the House of Lords on Thursday, October 24th, the Minister of Civil Aviation announced his intention to publish in future the complete reports of investigations into accidents occurring to British civil aircraft operating scheduled journeys or engaged on a charter, and in all accidents where death or serious injury had occurred. He intends to include also accidents where useful lessons could be learnt. If for security or other reasons publication would not be in the public interest, then naturally it would be withheld.

Enquiries into those accidents which cause unusual public interest, or which may be beneficial to development work may even, at the Minister's discretion, be held in public.

This will naturally apply to British aircraft operating in the United Kingdom or Colonies only.

Lord Nathan intends to discuss with other Governments the possibility of a universal adoption of the scheme, for, as Lord Swinton observed, it was one of the original provisions and intentions of the International Convention that there should always be the greatest possible pooling and publication of information.

GREATER SPEEDS

SPEAKING as chairman of the committee on air transport of the International Chamber of Commerce in Paris recently, Mr. Juan T. Trippe, president of P.A.W.A., forecast eight-hour services between the United States and Europe before the end of next year with aircraft which are now being built.

Although speeds to-day were good, he said, with aircraft carrying passengers at 300 m.p.h., the travellers in 1947 will be offered the option of travelling in luxurious aircraft with sleeping accommodation, cruising at about 340 m.p.h., or of travelling the same distance in less comfortable aircraft with cruising speeds up to 430 m.p.h., and not long after 1947 he thought even that figure would be exceeded. Mr. Trippe endorsed the views of many when he condemned red tape for depriving international air transport of the speed and regularity which it would otherwise provide, and called for international co-operation and intensive efforts to abolish excessive passport, visa and customs requirements, and for the impovement of ground facilities. A large volume of air travel is both desirable and attainable, he said.

CIVIL AVIATION NEWS

VICKERS' AFRICAN TOUR

A DEMONSTRATION and sales tour of very considerable extent and importance is now being made by Vickers-Armstrongs with a Viking. The aircraft, which is carrying, amongst others, Lt. Gen. Sir Ronald Weeks, the Deputy-chairman of Vickers, and Maj. H. R. Kilner, Deputy-chairman of Vickers-Armstrongs, was due to leave Northolt last Monday.

Some general facts about this tour were given in *Flight* of October 17th, and the itinerary, which will involve the flying of a distance of some twenty thousand miles, was outlined. The focus of the trip will be Johannesburg, where two visits will be made, during the second of which the party will remain for several days and the aircraft will be shown to South African Airways.

Various other important visits and demonstrations will be made for the benefit of different local airline operators. On the outward journey to Johannesburg, for instance, demonstrations will be given at Cairo to Egyptian Airways and Misr-Airwork. After leaving Johannesburg, where the aircraft will be serviced, it will be flown to Lourenco Marques, to be shown to D.E.T.A. Airways, and on a round tour including Nairobi, where it will be shown to East African Airways, and Salisbury, where it will be shown to Central African Airways. On the final return journey from Johannesburg, Wing Cdr. Boyd, the demonstration pilot on the trip, will take the Viking to Baghdad in order to interest Iraqi Airways, and will then return via Algiers, where Air France in North Africa will have a chance of seeing the machine. Central African Airways, incidentally, have already ordered three Vikings—which, with other orders from the Argentine, Denmark and India, makes a total of more than forty sales to purchasers abroad, in addition to the 112 aircraft which have been ordered by the Ministry of Supply for B.E.A.C.s. Some twenty-five have so far been delivered.

Needless to say, Sir Ronald Weeks will, during the trip, have the opportunity of renewing business contacts for the main Vickers organization and its subsidiary companies, but from the aviation point of view the tour may be even more usefully productive. A journey of this length and through such varying climatic conditions should provide an immense amount of useful information for the technicians with the party. So, apart from the maintenance crew, a flight observer will be carried.

TRANS-TARMAC: Passengers leaving a B.O.A.C. Constellation at Heathrow. The position of private cars on the tarmac suggests preferential treatment for some V.I.P.s.

DOVES FOR THE ARGENTINE

AN initial order for twenty D.H. Doves has recently been placed by the Argentine Government for use on tributary services feeding those which will be operated in due course by Vickers Vikings. This order brings the total number of Doves which have so far been sold to the very satisfactory figure of 255.

Civil Spitfire

First Private-owner Conversion of a Military Type

ON July 24th an old Spitfire IIA, P-8727, was flown to Marshalls of Cambridge by its new owner, Mr. M. L. Bramson. A little over two months later a civil-registered Spitfire, G-AHZI, was flown on test after overhaul and modification.

This civil Spitfire is likely to be of historical interest not only because it is the first of the type to be owned by a private individual, but also because it may enable all and sundry to learn whether it is possible to operate a somewhat over-powered fighter with reasonable economy and utility. The actual conversions involved the removal of the armour plating from the cockpit and of the gun installations from the wings. The latter modification made available a very fair degree of luggage space—though whether the owner will enjoy the job of undoing the fasteners and removing the panels each time remains to be seen. However, further luggage space is available in the fuselage.

It was necessary to fit additional ballast weights in the rear of the fuselage in order to compensate for the weight of the equipment removed forward of the c.g., but apart from the redecoration of the cockpit and the removal of gun buttons and so forth, the only other modification involved the lagging of those hydraulic and fuel pipe-lines forward of the fireproof bulkhead with fire-resisting material. Meanwhile, Marshalls had worked on the airframe generally and the Merlin had been given a major overhaul.

Mr. Bramson has been flying for a considerable number of years and was also, until recalled to more earnest business, in the A.T.A. during the early part of the war. So he should be quite happy as far as the flying of the Spitfire is concerned. Though this aircraft has been bought largely to provide personal "fun" for him, it will be used quite seriously for business journeys. He proposes to operate the Merlin at about 1,900 to 2,000 r.p.m. at a boost of about zero. At these figures the cruising speed will, in its somewhat cleaned-up form, be a little over 200 m.p.h., and the consumption about 30 gallons an hour. The normal tankage capacity is 86 gallons, which will give an endurance of 2½ hours—or a range of about 500 miles. For last cruising he will push the revolutions up to 2,200 and the boost to plus 4, thus producing about 250 m.p.h.

In due course, Mr. Bramson hopes to fit an auxiliary fuel tank in order to increase the useful range, and is obtaining the necessary VHF crystals so that he will have radio assistance.

The Spitfire IIA as it appeared after its civil conversion.

CIVIL AVIATION NEWS

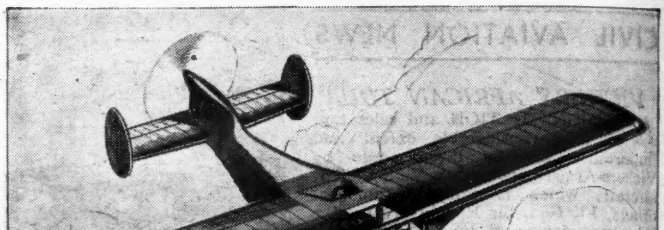
THE FIVE HUNDRED DAYS

SIR WILLIAM P. HILDRED, director-general of the International Air Transport Association, made his first annual report at the opening session of the annual general meeting of the Association in Cairo on October 29th. In the course of a comprehensive survey of the status of international air transport during the post-war period, Sir William drew attention to the great expansion in that period. The present 300,000-mile network of international air routes was more than double the mileage which existed before the war, and because of the airlines' record of performance, he continued, the five hundred days since the end of hostilities may eventually be known as the most splendid days in the history of international air transport.

Sir William pointed out that the airlines, more than any other agency of transport, were relied upon by the nations for the swift exchange of information, vital commodities, and brains, and he was happy to be able to report the success with which international airlines had met the challenge presented by the necessities of reconstruction. Many new companies had joined the roster of operators, and many European services which had been virtually destroyed by the war were now restored; in fact, many European companies had been able to reconstitute old routes and add new.

Making special reference to the Atlantic, he observed that eight nations were now flying regular schedules across the North Atlantic, and several more were making proving flights preparatory to permanent operations. The South Atlantic route had also been restored, and even extended. Sir William made the interesting observation that whereas traffic in passengers, freight and air mail had increased during the past year to greater than pre-war levels, the individual airline fleet tonnages had not grown in proportion. This meant, he said, that the airlines were getting more use from their aircraft now than ever before, in hours and carrying capacity, not only from the newer aircraft with longer range, higher speed and larger payload, but also from the very aircraft which had been operated before the war.

Sir William paid a tribute to the Governments which had contributed to the restoration of landing fields, navigational aids, control systems and the like, which formed the understructure of international airways. "Many fields," he said, "still bear the marks and limitations of war, but more and more reports reach us each week of restoration and improvement in these matters."



MIXMASTER IN MINIATURE : Distinctly unorthodox is the layout of the four-seater cabin aircraft now being developed by the Waco Aircraft Corporation. Apart from the use of a shaft-driven airscrew in the tail, the Aristocraft, as it is to be called, will have a simplified control system.

BREVITIES

The B.O.A.C./Qantas Lancastrian service between London and Sydney has now completed two hundred flights each way on this, the longest and fastest air route in the world. The winter schedule has now started and involves two additional stops—at Calcutta and Castel Benito.

* * *

Trans-Canada Airlines have started a daily service with Lockheed Lodestars between Fort William and Duluth in the Great Lakes area. The first trans-continental crossing has been made in both directions by T.C.A., with Merlin Skymasters, between Montreal and Vancouver. It is understood that T.C.A. have cancelled orders for Tudor aircraft, owing to a promised earlier delivery of DC-4s from Canadair.

* * *

A new folder, entitled "Going by Air," and containing useful information for inexperienced air travellers, has been issued by the Liverpool & London & Globe Insurance Company. The folder contains a diagram giving changes in times in different parts of the world, useful hints, and a note of the various forms of aviation insurance now available for passengers, baggage and goods.

* * *

British European Airways have carried out a Viking proving flight to Madrid and Lisbon.

* * *

Capt. Nils Steen, a Norwegian pilot, has been presented with the Honorary O.B.E., in recognition of his valuable services as a pilot on the wartime air route between Great Britain and Stockholm.

* * *

B.S.A.A. are being forced to vary the route from the U.K. to Central America owing to recent bad weather in the Azores. The route is sometimes through Prestwick and Gander, and at other times through Dakar and Natal.

* * *

K.L.M now have several Douglas DC-4 aircraft based at Curaço. The purpose of this is to link the West Indies with New York, and so give a direct service from Amsterdam by K.L.M. The company have not fifth freedom rights in New York.

Several D.H. Doves off the production line have now been delivered to operators. Skyways took delivery of theirs quite recently, and this aircraft is perhaps the first one to be actually carrying fare-paying passengers.

* * *

An agreement has been signed between Britain and Portugal providing for air services between British and Portuguese territories.

* * *

Aer Lingus expect to extend their services rapidly during the next few months, in addition to the Constellation trans-Atlantic service which should come into operation next year. Pilots and ground personnel are now in training in Britain on Viking aircraft, which will be used on the routes from Shannon. Scheduled services are to be flown to London, Stockholm, Rome and Madrid. Early in the new year there will also be a service to Glasgow and a triangular route to Belfast and Liverpool.

* * *

The Howard Hughes all-wood flying-boat is reported to be nearing completion at Long Beach, California. The eight 3,000 h.p. engines are now installed and taxying tests are expected to start during November.

* * *

Gateacre Hall, situated about fifteen minutes by road from Speke Airport, is to be opened as a residential club by Airport Services Catering, Ltd., to provide amenities for crews and passengers passing through the airport.

* * *

Air France will be transferring activities from Croydon to Heathrow during November. Heathrow has been chosen in preference to Northolt as Air France aircraft are fitted with SCS.51, which is being installed at London Airport. B.E.A. will continue to handle Air France traffic.

* * *

It is understood that Bovingdon is to be officially recognized as a diversion airport for Northolt, and may at times be used as an alternative by B.E.A. for reasons other than weather. Manston may also be used for diversions, but no outward services will be flown from either.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

POTENTIAL DANGER

In the Grouping of Feathering Buttons

IT would be interesting to know how many lives have been lost and aircraft wrecked through the wrong engine being feathered.

Could not the buttons be placed apart instead of together (as I see they are in the "Wayfarer") or be incorporated, through a gate, off the bottom register of the pitch control as in the Halifax II, if my memory serves.

A pilot is not expected to make a fool of himself when an engine cuts unexpectedly, but I do think that the present, almost universal, grouping makes it easier for him to do so.

HUGH S. TOVEY.

"A PRESENT FOR KASJA"

Lucky She Wasn't a Belgian!

From the Comte Dumonceau de Bergendal.

I AM just reading your short story called "A Present for Kasja" (*Flight*, September 19th).

If I may express my humble opinion, you Dutch and British peoples are very lucky to have airlines with only three or four initials.

What about us poor Belgians? Should I have to name my next, Susie, Anne, Beatrix, Eve, Nancy, Audrey; or Simon, Andrew, Bernard, Elfed, Norbert, Albert, for getting a silver christening bowl from the Sabena?

I am not quite sure the godfather or godmother will agree.

I. H. DUMONCEAU,
Lieutenant,
Belgian Air Force.

SUPERSONIC SUGGESTIONS

On How to Get More Speed

I UNDERSTAND from the article "Miles on Supersonic Flight" (*Flight*, October 3rd), that the trouble arises through forcing an aircraft through air not ready to receive it, the plane travelling faster than its vibrations. I suggest sending the air a radio message as this would travel at 183,000 miles per second and so be faster than the plane. The air could then get into position to meet the machine, and so eliminate shock waves, etc.

Another method would be to heat up the air electronically in front of the plane and so increase the speed of sound. (What is the speed of sound at 500 deg F?)

Either method would increase the speed of the aircraft and lighten its weight owing to the elimination of the great strains it has to stand. Less h.p. would be needed to attain these high speeds, and I am sure our scientists should explore the means to make this possible. D. M. CARVER.

[Our correspondent's suggestions remind us that the late Will Rogers put forward a remedy, brilliant in its simplicity, for the U-boat menace during the 1914-18 war. "All you have to do," he said, "is to raise the temperature of the sea to boiling point." When asked how this was to be accomplished he airily replied, "Say, I give you the big idea; *you* work out the details!"—ED.]

AUXILIARY SAILPLANES

Suggested Organization for Enthusiasts

ARE there any of your readers who might be interested to band themselves together with the object of forming an association of auxiliary sailplane enthusiasts? Such a movement might convince the engineers of the power-unit and designer-constructors of the airframe, who jointly produced the Carden-Baynes auxiliary sailplane, of the existence of a moderately good market; they might then give us the benefit of their valuable experience with this type of aircraft and resume the activities suspended on the death of Sir John Carden.

In any case, enough support for such an organization might be forthcoming for each member to pool his experience and give practical assistance in the construction of a prototype for experimental purposes. This prototype could serve as a model from which each member could construct his own machine (at his own expense, of course) with the help of fellow members.

In order to assess the possibilities of success for such a project, all those seriously interested are cordially invited to write to me, c/o London Savings Bank, 144, High Holborn, London W.C.1. D. USHER.

PRIVATE FLYING

Youthful Enthusiasm Handicapped

MR. RICE in his letter of October 17th voiced an opinion which has been burning inside everyone who is in any way connected with air-minded youth.

I have a flight of Air Rangers in East London, the girls of which are tremendously enthusiastic but are handicapped by having to fight for every inch of progress; we are finding it difficult to raise sufficient funds for one ranger to fly.

Can nothing be done to overcome these obstacles? The Air Defence Corps started the struggle which is still being continued by the Air Training Corps with little headway. Surely the Government has some interest in the country's youth, or does it end with the orange juice and cod-liver oil stage?

PEGGY E. RILEY.

AIR CRASHES

First-aid by Helicopter

A HIGH percentage of aircraft accidents are due to an error of judgment or a mechanical failure on take-off or during the approach and landing, resulting in the aircraft crashing beyond the actual perimeter of the airfield.

The time-lag between the accident and the arrival on the spot of fire tender, ambulance, etc., is proportional to the distance these vehicles must cover to reach the scene.

The intervention of a hedge, barbed wire fence, ditch, soft ground or ploughed field magnify this time lag to a point where aid becomes hopelessly and uselessly too late in arrival, and what airfields have we without one or a vicious combination of these obstructions?

A few of the pounds being expended in aircraft production and development might be profitably invested in building a helicopter with the necessary requirements.

Such a machine has possibilities I need not enlarge upon, and would be a re-assuring (?) sight to those intimidated by the recent chain of misfortune.

The argument that such aircraft would require skilled operators is countered by the fact that aircraft crashes *need* highly technical treatment! "474."

AIRCRAFT MAINTENANCE

An Inspector's Serious Allegation

DURING the course of my employment as senior crash inspector I have been called upon recently to inspect and report on a passenger airliner which crashed in this country.

Following is a short digest of this report, and it is not an isolated incident by any means, as I have had my attention drawn to alleged "rogue" aircraft which on inspection have disclosed bad maintenance as the cause, coupled with careless workmanship, lack of proper tools and facilities, and a psychological lethargy, which seems to be a war inheritance, and apparently affects all departments, including inspection.

On inspection of the aircraft mentioned the control surfaces were either sloppy or excessively tight, and all cable tensions were incorrect, varying from plus 60 lb to minus 60 lb. Engine controls were no better. The cables had been re-run and control surface movements had been altered and limited, some almost 50 per cent. A very important undercarriage replacement, obviously lost during a major inspection, had been replaced by a manufactured part of the wrong specification. This part had caused undercarriage failure and a belly landing.

There is obviously something lacking somewhere; and with airlines springing up like mushrooms, the need for closer scrutiny and stricter inspection embracing design load and maintenance becomes increasingly necessary if we are to retain the confidence of the public in air travel.

INSPECTION.

[It is difficult to believe that the instance quoted by our correspondent is typical of aircraft maintenance generally. While we fully agree as to the vital importance of this aspect of aircraft operation, it does not appear likely that the majority of the crashes which have occurred recently can be attributed to indifferent inspection and maintenance.—ED.]

SERVICE AVIATION

BOLD, BAD BRIGAND : On one of its twin Bristol Centaurus 18-cylinder sleeve-valve radials the Bristol Brigand torpedo-fighter flies comfortably with its 18-inch torpedo and R/P load.

Royal Air Force and Naval Aviation News and Announcements

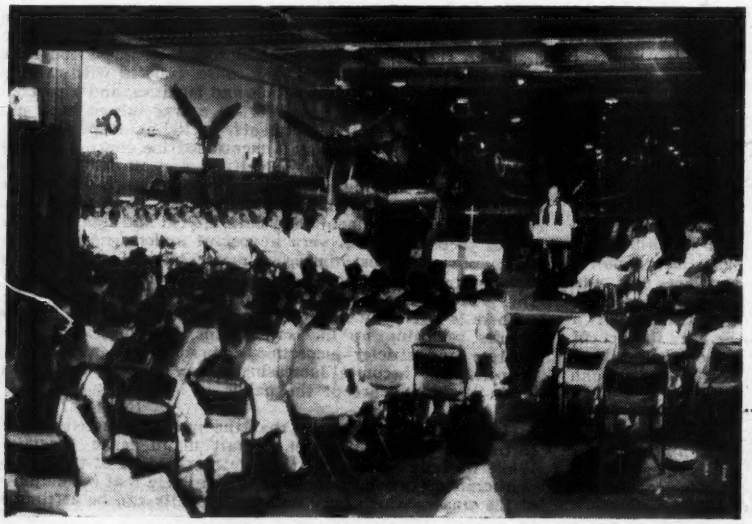
"Aries" Off Again

ARIES, the famous Lancaster of the Empire Air Navigation School at Shawbury, near Huntingdon, which has already flown nearly a quarter of a million miles and only recently returned from a visit to Australia and New Zealand, in the course of which it established three new speed records, left for Canada and the United States of America on Thursday, October 24th.

By now, *Aries* has become almost a household word in the R.A.F., but it is only two years, soon after its delivery to the Empire Air Navigation School, since it first attracted public notice by completing the first round-the-world trip by a British Service aircraft. In the following year it made its famous flights over the geographical and magnetic North Poles. This was the occasion when it was first discovered that the North Magnetic Pole lies not in its charted position in Boothia Peninsula, but some 2-300 miles N.N.W. of this.

Group Captain D. Finlay, O.B.E., Deputy Commandant of the School, will lead the mission, and the captain of the aircraft will be Wing Commander O. M. Dunnicliffe, D.S.O., D.F.C., who piloted *Aries* on her record flight to Cape Town earlier this year.

As usual on these missions, a lecture programme will be carried out and the latest navigation facilities in aircraft demonstrated. These will include H2S Mark 111G, Lucero, Loran, Magnesyn compass, magnetic dip indicator, air position indicator, ground position indicator and various types of bubble sextants. Certain items of German navigation equipment will also be carried. Further work will be carried out on the new navigation technique known as " pressure pattern flying."



SUNDAY SERVICE : The Padre of the aircraft carrier H.M.S. *Ocean* holds Sunday Morning Service in the hangar, with Firefly I fighter-reconnaissance machines in the background.

Nuremberg Trials Courier Service

THE hanging of the Nazi war criminals sees the end of another R.A.F. commitment—that of carrying secret reports, official documents, Press reports, newsreels and B.B.C. recordings between Furth landing ground, near Nuremberg,

SERVICE AVIATION

and the Royal Air Force Station Blackbushe, England.

For the duration of the Nuremberg Trials, these documents were flown to the United Kingdom daily. Four Mosquitoes were available, two at Blackbushe and two at Furth. The Courier Service commenced on November 15th, 1945.

This work was handed to No. 2 Group, R.A.F., Gütersloh, which employed aircraft and personnel of Nos. 305 (Polish), 421 and 107 Squadrons. Each squadron undertook a month's duty in turn and supplied aircraft, crews and ground staff for maintenance. The Polish squadron took the first tour of duty and set a standard which remained high throughout the time the service operated.

Frequently, ordinary transport aircraft were grounded owing to bad weather during last winter and the spring, the Mosquitoes rose to the occasion. More often than not there would be broken cumulus cloud over the landing ground at Furth, and sometimes the area would be blanketed with thick cloud, making landing a hazardous undertaking. In fact, there were only two occasions when the "Mossies" failed to operate during the whole of the time that the Trials were in progress.

Two Mosquitoes were held at the terminal landing grounds daily in readiness for the mission, one to do the actual journey, and one in reserve. With clockwork regularity, at 13.30 hours each day, the crews received the sealed mail bags, and within two or three hours dispatches and reports were delivered in Whitehall, copy was being sub-edited in Fleet Street, and on quite a number of occasions B.B.C. recordings were being run over in readiness for a broadcast of the day's proceedings in the six o'clock news.

Offers of Permanent Commissions

THE following officers have been selected for permanent commissions in the R.A.F., including further selections for the new Secretarial branch.

By the end of September 1,550 officers had been offered permanent commissions.

WING COMMANDERS: G. V. Fryer, A.F.C.; A. F. McGhie; J. H. Newberry, D.F.C.; M. W. Renaut, D.F.C.; D. C. Smythe, D.S.O., G.M.

SQUADRON LEADERS: H. R. Allen, D.F.C.; F. O. Barrett, D.F.C.; E. Bell, A.F.C.; J. C. Blair, D.F.C., A.F.C.; A. W. Bower, D.F.C.; J. F. J. Dewhurst, D.F.C.; R. J. A. Good; J. Harris, D.F.C.; J. C. Johnson, D.F.C.; J. G. Messenger, D.F.C.; A. Sandison, D.F.C.; M. P. Stanton; G. E. Willis; R. G. Wilson, D.F.C.

FLIGHT LIEUTENANTS: R. E. R. Adams; B. A. Colvin; R. L. S. Coulson; R. A. Crone, D.F.C.; C. G. L. Golding; J. G. Harrison; B. P. T. Horsley, A.F.C.; D. L. Hughes, D.F.C.; G. C. Lamb; D. S. Lister; J. I. Parker; A. P. Skinner, D.F.C.; D. A. Trotman; J. K. Underwood; J. Welch, D.F.C.; A. E. C. Wilkie.

Technical Branch

SQUADRON LEADERS: E. G. Alford, G.M.; T. V. Betty; H. W. Cambell; E. S. R. Coakes; J. Law; B. K. Morris; A. A. Pedder; V. F. Wallace; D. T. Way, O.B.E.

FLIGHT LIEUTENANTS: A. F. Bailey; D. G. Beal; E. W. G. England; P. S. Goffey; A. W. Gregg; H. Harvey; R. H. Macmillan; H. P. McGrath; J. S. Palmer; J. F. M. Reid; F. Roman, M.B.E.

FLYING OFFICERS: J. A. Howard; S. G. E. Payne.

Accountant Branch for Secretarial Branch

SQUADRON LEADERS: T. G. Galway; V. W. A. Matthews; J. L. Sefton; M. J. Toby.

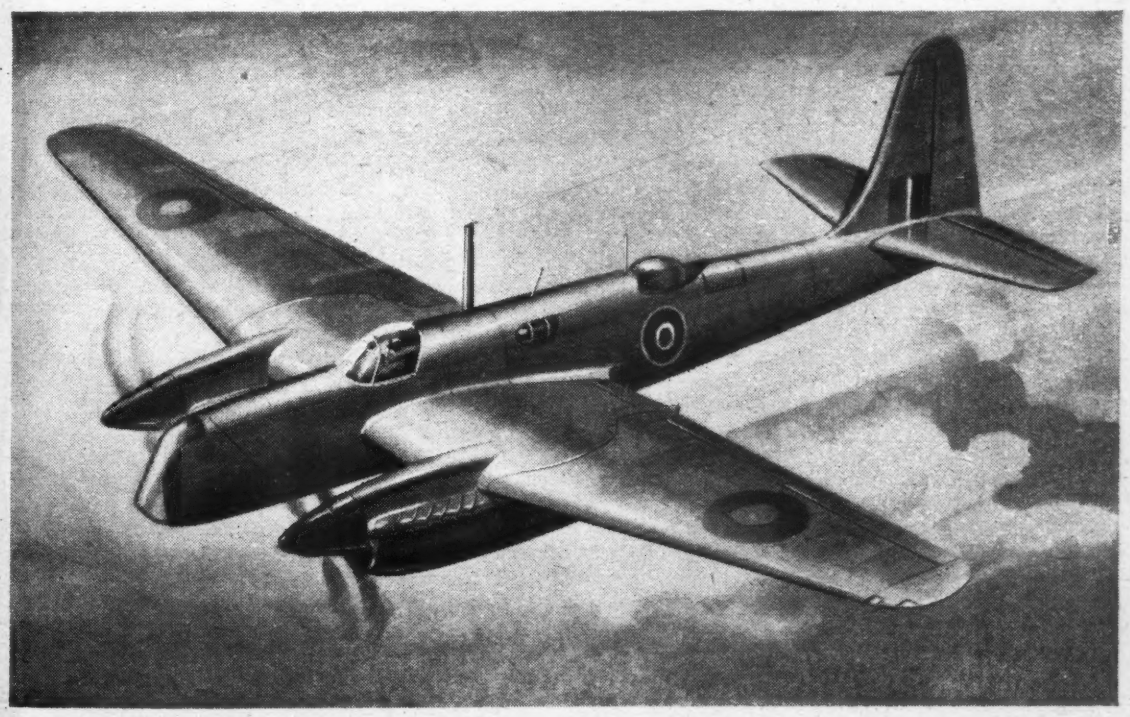
FLIGHT LIEUTENANTS: C. Cameron; A. Cockman; A. M. Durling; D. J. Gould; J. Howell.

R.A.F. Medical Equipment for Malaya

THE R.A.F. are supplying a considerable quantity of urgently required medical stores to help build up the dangerously depleted resources in civilian hospitals throughout Malaya. The supplies will be delivered shortly to Dr. R. B. MacGregor, C.M.G., Director of Medical Services of the Union.

Air Ministry permission was given in August to dispose of some of the surplus medical stores at the R.A.F. Hospital, Singapore, which were originally intended for "Tiger Force"—on its way to Okinawa when the Japanese surrendered.

As soon as he heard that drugs, dressings and surgical instruments were in urgent demand for Malaya's hospitals, Air Commodore P. G. Livingstone, C.B.E., A.F.C., Principal Medical Officer, Air Command, South-East Asia, decided, with the concurrence of the



HIGH-SPEED TUG: This *Flight* sketch shows how the special fuselage of the target-towing and target version of the Sturgeon modifies the appearance of the aircraft, correspondingly re-designated as Sturgeon T.T. Mk. II. It is possible that carriers may eventually carry one or two Sturgeons apiece to provide practice for the guns of the Fleet.

SERVICE AVIATION

Allied Air Commander-in-Chief, to make available as speedily as possible a consignment of R.A.F. medical stores—in the interests of the health of the civil population.

No. 155 Squadron Disbands

NO. 155 Squadron, Royal Air Force, has just been disbanded after a varied and distinguished career.

The work of the squadron under the command of Air Headquarters, Netherlands East Indies, has not held the thrills and glory of earlier days, but has been of first importance to the land forces under the command of the 26th Indian Infantry Division in Sumatra.

Formed in April, 1942, using Mohawk aircraft, the Squadron commenced operations from Madras, but soon moved closer to the battle area, providing fighter escort to Blenheims attacking the enemy's installations in Burma.

In February, 1943, the Squadron was based at Rajyeswurpur on the Arakan coast with one flight detached to Imphal, Manipur States. For months the whole unit carried out an intensive series of operations, strafing the south and east of Burma. Its aircraft also operated in direct liaison with the Army, learning the role they were to play from the late General (then Brigadier) Wingate at H.Q. 4 Corps.

By the end of 1943 the squadron had completed twelve months of intensive action and was withdrawn to Calcutta for a deserved rest and the conversion to Spitfires.

Back on operations, 155 Squadron Spitfires carried out fighter interceptions, strafing and bombing attacks, escort work and patrolling with marked success. The Spitfires played a major part in pushing the Japanese out of Burma and maintaining air superiority which had been wrested from the enemy.

After the capitulation of the Japanese the squadron moved to Singapore, where they were based until February, 1946. For the few months prior to their disbandment they were operating from Medan, Sumatra.

W.A.A.F. Nursing Courses

AS part of the R.A.F. educational and vocational training scheme a series of courses in nursing for W.A.A.F. personnel of R.A.F. Maintenance Command is being held at R.A.F. Station, Kidlington, in co-operation with the Ministry of Labour and National Service.

The courses, which are of a week's duration, include talks by experts and visits to various types of hospitals, and provide both for women who have already decided on nursing as a career and also for those who are inclined to consider it.

Earlier in the year, in view of the acute shortage of nurses, an effort was made to interest W.A.A.F. personnel in the profession and a series of six pre-vocational nursing courses was held at Kidlington with markedly good results, no fewer than 54 of the total of 68 who attended deciding to take up nursing as a career and 14 obtaining a class B release for this purpose.

Similar courses have also been held for W.A.A.F. personnel of Bomber Command and Transport Command.

The Bandoeng "Bus Service"

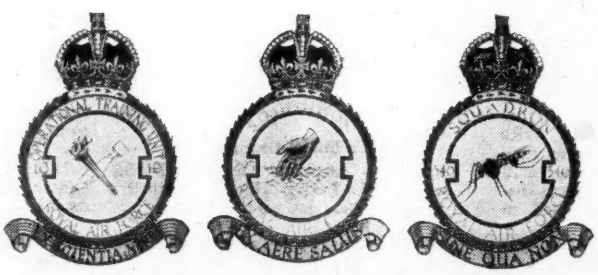
AS far back as last November the first Dakota Squadron crossed the hills and landed at Bandoeng to begin a service which was later to become one of the major operations in air-supply. At first, only occasional flights were required to carry in urgent stores and to return with ex-P.O.W.'s and internees. In January, however, the demands on the squadron were greatly intensified as it was entrusted with the task of supplying Bandoeng with all its essential food and supplies. The onus of this undertaking was shifted to Air Transport when it was found that road and rail convoys were meeting with considerable opposition. Although the hostility of the Indonesians slowly became less serious and was, by June, almost negligible, the supply situation still demanded that all available aircraft be used for this work.

Throughout the whole of No. 31 Squadron's stay in Java—and it is now almost a year since the Squadron first commenced operations in the N.E.I.—the maintenance of supply services to Bandoeng has been its main responsibility. Nearly every day there has been an unceasing flow of aircraft over the mountains, flying, in 35 minutes, the distance which by road would take several hours. The regularity with which each aircraft carried out its four sorties daily on this run won for it the title of "The Bandoeng Bus Service"—now equally well known to the Dutch as to the personnel of 31 Squadron.

During the early part of the year bad weather necessarily curtailed the scale of operations on the "bus service." Probably the worst weather to be found in the N.E.I. prevails in the mountains around Bandoeng during the monsoon period. Dangerous cumulus cloud builds up on the peaks during the morning, and the valley, through which is the only means of entry into Bandoeng, fills up with treacherous storms.

Despite the very bad weather conditions which resulted, the daily commitments rarely fell short of the target figure. The task of keeping the supplies pouring in at the rate of about 120 tons a day strained the Squadron's capacity to the utmost.

In recent months additional commitments and other factors have resulted in a reduced scale in operations on the "bus service." However, four sorties are still maintained with a daily average of eight aircraft and this will be continued until 31 Squadron ceases to operate in the skies of Java.



The badges of (left) No. 10 Operational Training Unit, R.A.F.—Ex Scientia Vires (Strength out of knowledge). (Centre) No. 293 Squadron, R.A.F.—Ex Aere Salus (Salvation from the air). (Right) No. 540 Squadron R.A.F.—Sine Qua Non (Indispensable).

Prizes in Memory of R.A.F. Sergeant

MAJOR KEITH GROVES, J.P., and Mrs. Groves, of Maughold, Isle of Man, have placed at the disposal of the Air Ministry a sum of money to found three prizes in memory of their son, the late Sergeant (Meteorological Air Observer) Louis Grimble Groves, R.A.F.V.R., who lost his life on a meteorological sortie in September, 1945.

These prizes, which will be awarded annually on July 1st, commencing in 1947, have as their objects the encouragement of the study of the problems of the safety of aircraft and flying personnel, the stimulation of research in the science of meteorology and the application of meteorology to aviation, and the recognition of meritorious work by flying personnel employed on meteorological air observer duties.

They will be known as:

The L. G. Groves' Memorial Prize for Aircraft Safety;

The L. G. Groves' Memorial Prize for Meteorology; and

The L. G. Groves' Memorial Award for Meteorological Air Observers.

Both the prizes and the award will be given at least partly "in kind" and the winners will be consulted as to the precise nature of the object to be presented (e.g., books, instruments, etc.), which will be suitably inscribed. If the object selected by the winner does not absorb the whole of the income available that year for the particular prize, the winner will receive the balance in cash. The names of the winners will, as in the case of winners of other Memorial Prizes before the war, be recorded in the Air Force List.

The L. G. Groves' Memorial Prize for Aircraft Safety, of the approximate annual value of £37 10s, will be awarded for the most important contribution during the year towards the safety of aircraft and flying personnel, either by practical work or by the writing of constructive papers. The L. G. Groves' Memorial Prize for Meteorology, of the approximate annual value of £25, will be given for the most important contribution during the year either to the science of meteorology or the application of meteorology to aviation.

The L. G. Groves' Memorial Award for Meteorological Air Observers, of the approximate annual value of £12 10s, will be confined to flying personnel who have been employed during the year on meteorological air observer duties and will be awarded for meritorious work or devotion to duty.

Major Groves is the brother of the late Air Commodore R. M. Groves, C.B., D.S.O., A.F.C., who was killed in an aircraft accident in Egypt in 1920 and in whose memory four prizes for the benefit of the R.A.F. were founded.